AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

MAY 1, 1956

In This Issue

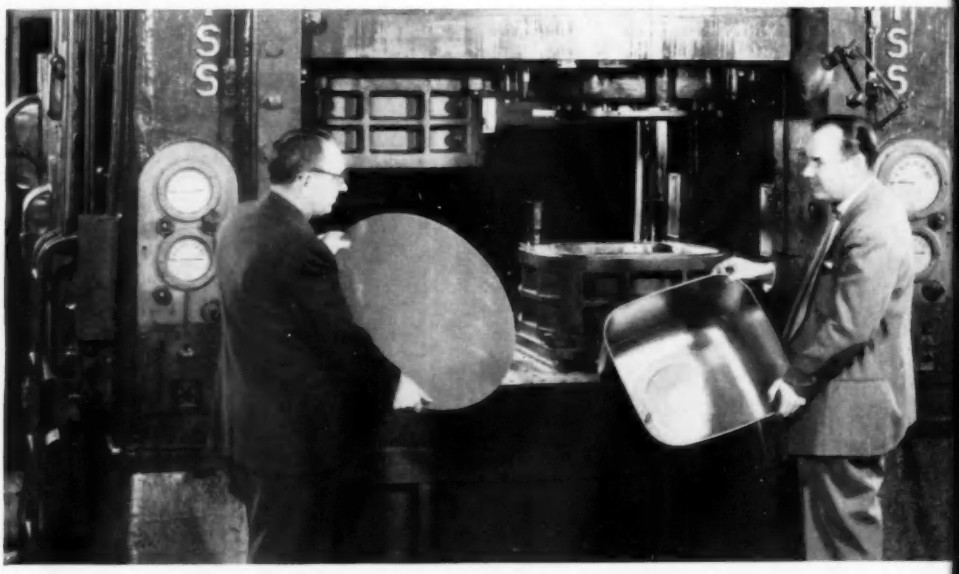
Features of American Motors' V-8 Engine Plant
World's First Automobile with Free Piston Engine
Metallurgy of Gears for Automatic Transmissions
High Spots of National Meetings of SAE and ACS
Painting Facilities in Chrysler's Canadian Plant
Unusual Production Methods for Continental Mark II

COMPLETE TABLE OF CONTENTS, PAGE 3

A CHILTON PUBLICATION

"We have no operating problems when we use STANOIL Industrial Oil"

Midwest Metal Stamping reports results of 8 years of press operation using STANOIL



Don Foster, Midwest Stamping Purchasing Agent and Jesse Nelson (right), Standard Oil industrial lubrication specialist, display metal blank and finished tub turned out on Bliss press. Technical service on lubrication problems is Jesse Nelson's job. He's been doing such work for seven years. Jesse has an engineering degree from the University of Iowa and is a graduate of the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them.*

In 1948, Midwest Metal Stamping Company, Kellogg, Iowa, put into service a Bliss Hydro Dynamic Press. STANOIL Industrial Oil was selected as the hydraulic medium. The initial fill was 1,400 gallons. The press operated continuously from 1948 until Christmas, 1954, when it was shut down five days for overhaul.

At the time of overhaul, the STANOIL Industrial Oil was drained. And here STANOIL'S superior demulsibility was demonstrated. Due to the high rate of condensation, two barrels of water were removed from oil reservoir. An oil analysis in the Standard Oil laboratory proved the oil still suitable for continued service. After filtration, it was returned to the reservoir and the press put back in operation. STANOIL continues to deliver the same perfect performance for Midwest as before.

STANOIL Industrial Oil can perform just as efficiently for you. Find out. There is a Standard Oil industrial lubrication specialist near you in any one of the Midwest and Rocky Mountain states. Call him. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

Stamping being removed from press by operator George Johnson. Press has used STANOIL Industrial Oil as hydraulic medium for eight years. Oil has perfect performance record.

STANDARD OIL COMPANY
(Indiana)

STANDARD

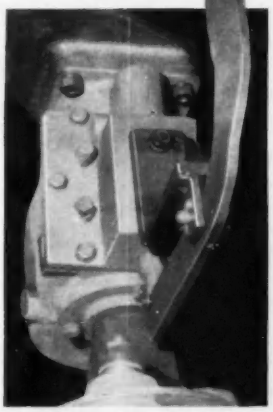
"Workin' on the railroad"

NOW IT'S EASY!

with Cotta two-speed transmission

Digging in new ties with pick and shovel is slow and expensive. Machinery does the job better and faster — especially a machine like the Fairmont Tie Bed Scarifier. This powerful unit digs a uniform tie bed 10 ft long in *only 60 seconds!* Propelling drive uses a rugged Cotta two-speed transmission — low speed for working and high speed for deadheading down the tracks. Fairmont selected Cotta because of excellent performance on other Fairmont equipment.

Heavy-duty Cotta units can be found on rail cars, maintenance of way equipment, locomotives, shovels, cranes, and similar heavy-duty equipment. Look to Cotta if you have a power transmission problem in the input torque range of 150 to 2000 ft lb. Cotta engineers can solve your problem with a standard or "engineered-to-order" unit.



Two-speed heavy-duty transmission on Fairmont Scarifier has low speed for working, high speed for traveling.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

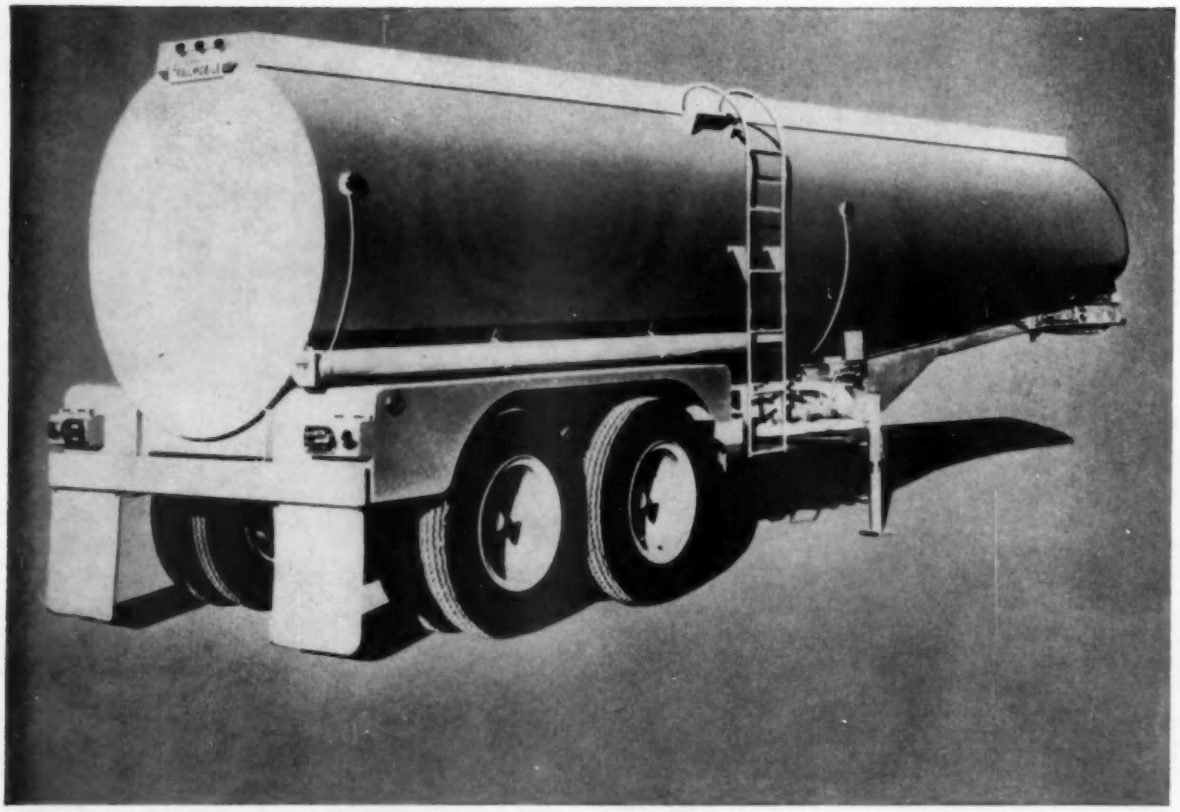
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA

HEAVY-DUTY TRANSMISSIONS

"Engineered-to-order"



Most recent design of lightweight steel tank-trailer developed by the Tank Division, Trailmobile, Inc., at Springfield, Mo., where the unit is now in production. Designers stripped off needless weight by using USS COR TEN, a high-strength, low-alloy steel containing nickel, produced by United States Steel Corp., Pittsburgh, Pa.

2440 pounds trimmed off...

Use of high strength low alloy nickel-copper steel adds capacity to trailer

REDUCED OPERATING COST is one result of this weight reduction. There's less wear on tires and brakes. And fuel is saved every day.

Yet payload is up. Over-all strength of the unit is unchanged.

In place of hauling needless weight every trip, this tank-trailer can deliver 400 extra gallons of gasoline or 340 extra gallons of fuel oil. Either increases revenue per ton mile.

Engineers at Trailmobile, Inc. aimed for several advantages by using basic properties of high strength low alloy steel containing nickel. In thin light section, steels of this type provide the same strength as thicker, heavier sections of carbon steel. But reduction of deadweight is not the entire story.

Offering high resistance to atmospheric corrosion . . . 4 to 6 times that of carbon steel . . . the nickel alloyed steels retain a high proportion of their original strength during years of use. This assures longer equipment life and cuts down maintenance and repair costs.

In addition, you'll find that high strength low alloy steels containing nickel can be hot or cold formed about as readily as mild carbon steels. Use of these steels helps to reduce unit labor cost as well as production time.

Produced under various trade-names by leading steel companies, high strength low alloy steels containing nickel along with other alloying elements, offer money-saving advantages. Learn more about these steels . . . send for a copy of "Nickel-Copper High Strength Low Alloy Steels." It discusses design factors, corrosion-resistance and the like. Write for it now.

INCO **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

MAY 1, 1956 — VOL. 114, NO. 9

FEATURES

AMC V-8 Engine Plant. *By Joseph Geschelin*.... 48
SAE Aeronautic Meeting. *By Charles A. Weinert* 52
First Automobile with Free Piston Engine..... 54
Production Techniques for Continental Mark II.. 56
Efficient Assembly of Parts by Staking..... 58
Standardized Automatic Transmission for New Clarklift Trucks 60
Chrysler's Advanced Facilities for Painting in Canadian Plant. *By Joseph Geschelin*..... 62
Metallurgy of Automatic Transmission Gears. *By William G Mertens and Frank Zuzich*..... 66
American Chemical Society's 129th Meeting.... 71
Drop Forgings Keep Pace with Developments.... 94
1956 Mobilgas Economy Run. *By Max Epps*..... 100

NEWS PREVIEWS

Chrysler's Expansion to Cost Over $150 Million.. 33
Studebaker-Packard Weighs Plans for Future.... 33
Ford 'E' Car Cost Estimated at $250 Million.... 33
Ferguson Car Details Remain Under Close Wraps 34
GE Unveils Ultra-Modern Plant for Motors..... 35
Ford Aide Predicts $16 Billion in Car Sales..... 35
White Sales, Earnings Rose to Peak in 1955..... 35
GM First Quarter Profits Off 8.5 Per Cent..... 36
Fruehauf Sales Rise 50 Per Cent Above 1955.... 36
Elastomers Laboratory is Opened by Du Pont.... 37
ASME Gas Turbine Conference..... 38
Buick Confident It Will Hold 10% of Market.... 39
S-P Subsidiary Constructing Research Center.... 39

DEPARTMENTS

Calendar of Coming Events..... 28
High Spots of This Issue..... 31
News of the Automotive and Aviation Industries 33
Men in the News 41
Automation News Report. *By Samuel Cummings* 72
Machinery News. *By Thomas Mac New*..... 79
New Plant and Production Equipment..... 80
Free Literature and Free Information Service.... 89
New Automotive and Aviation Products..... 92
Metals. *By William F. Boericke*..... 96
Observations. *By Joseph Geschelin*..... 98
On Our Washington Wire..... 111
Shorties 112

Business Department Staff..... 31
Chilton Officers and Directors..... 31
Advertisers' Index 150

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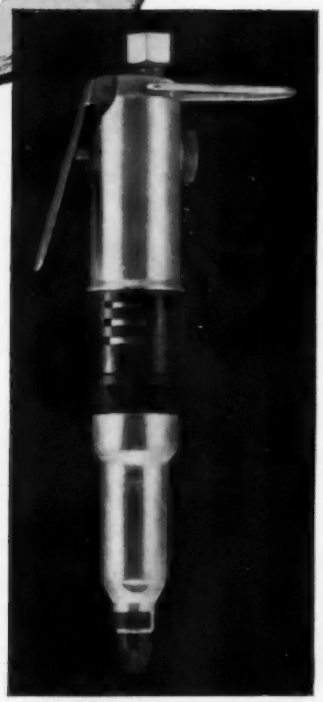
Sets 'em twice as fast!



New Rotor "02" Nutsetter cuts job time 50%

Nutsetters here, on radio chassis assembly, operated at 1200 rpm. Changed to Rotor S-02 LC Air Nutsetter . . . operates at 2500 rpm and handles easier. Cut time in half. Savings paid for Rotor tool in 7 weeks. Let's see what we can do for *you* with the new Rotor tools! Ask for Bulletin 46.

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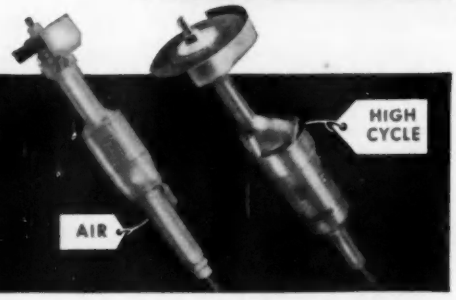

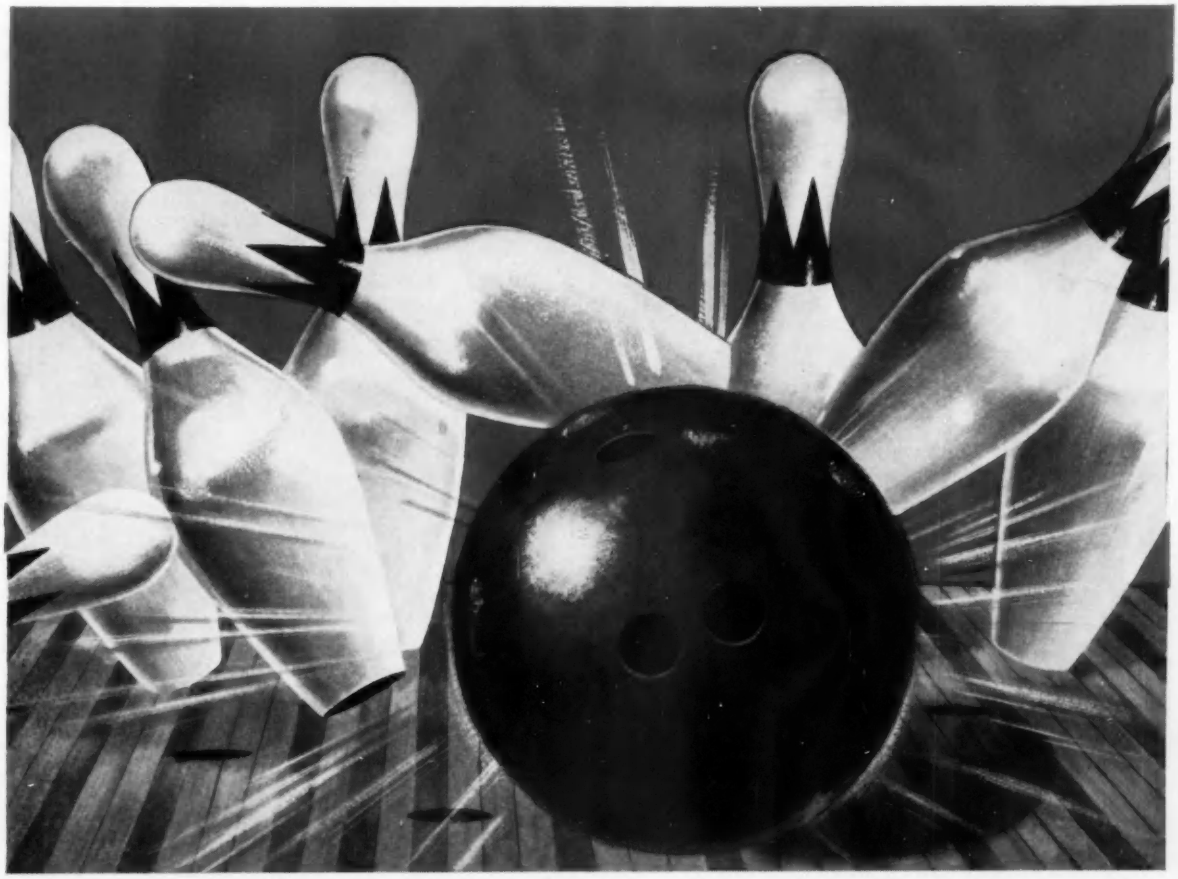

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...with J&L 1200 COLD FINISHED STEELS

When your machining applications require a steel that's tops in quality, machinability, uniformity and surface finish—"J&L 1200" Cold Finished Steel is the answer. It's one of a complete line of premium quality, free-machining bar steels developed over the years by J&L specialists. Thus, we can recommend the right type to help solve your problems.

Operators in shop after shop around the country using "J&L 1200" report:

- **Better machine finishes**
- **Improved tool life**
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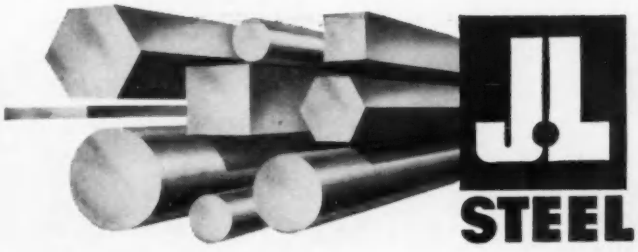
Use this steel in your own shop to secure better work at lower over-all costs. Results will convince you "J&L 1200" deserves to be a regular specification for your production runs.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor today for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



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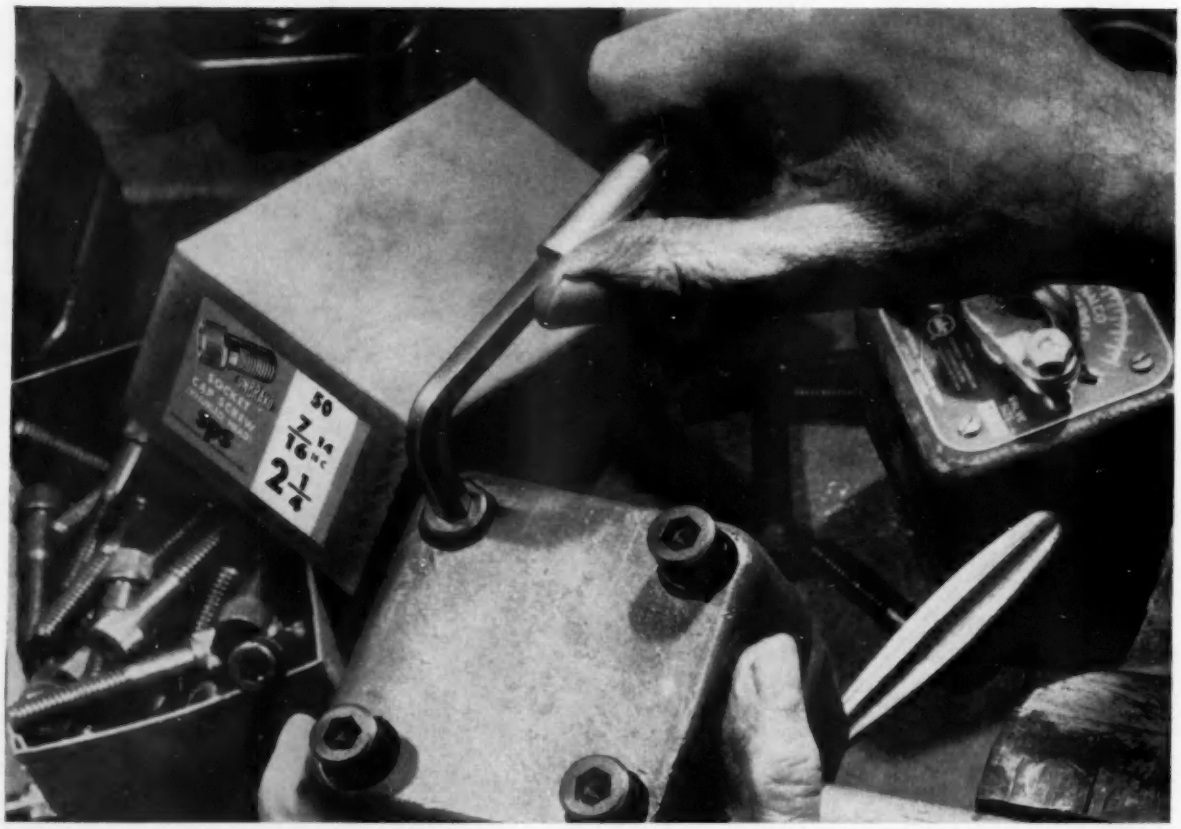
COLD FINISHING PLANTS AT PITTSBURGH, PA., AND HAMMOND, IND.

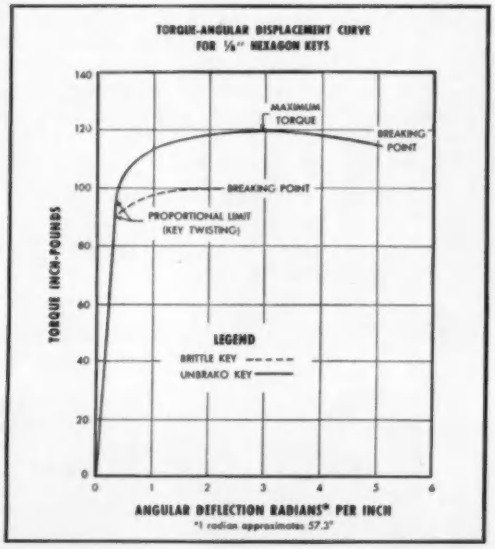


Tighten socket screws tighter, more safely with High-Titan UNBRAKO hex keys

High-Titan UNBRAKO socket screw keys are stronger than ordinary keys. They are made of selected, accurately sized hex stock, with carefully formed 90° bends that won't break. The ends are cut square to engage sockets full depth for highest tightening power. These keys are heat treated uniformly to give hardness and ductility clear through without brittleness or decarburization.

All this results in many advantages. You can torque up a screw tighter with an UNBRAKO than any other key. Performance is consistent—you can apply the same tightening torque every time. Screw sockets won't ream, and the keys won't wear excessively. If you should apply too much torque, a High-Titan would break, but shear off clean and even with the top of the socket—not at the bend—and without leaving jagged exposed edges to gash your hands.

One High-Titan hex key is included with each standard package of UNBRAKO socket screws. High-Titans are also available as sets in convenient, durable plastic key folds, and in bulk. Your authorized industrial distributor carries them in stock. See him today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.



THESE CURVES SHOW THE DIFFERENCE between an UNBRAKO hex key and an ordinary key. The UNBRAKO withstands more tightening torque, twists through 180° without breaking, then shears off even with the top of the screw socket. Ordinary keys snap off suddenly at the bend.

UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.
SPS
JENKINTOWN PENNSYLVANIA

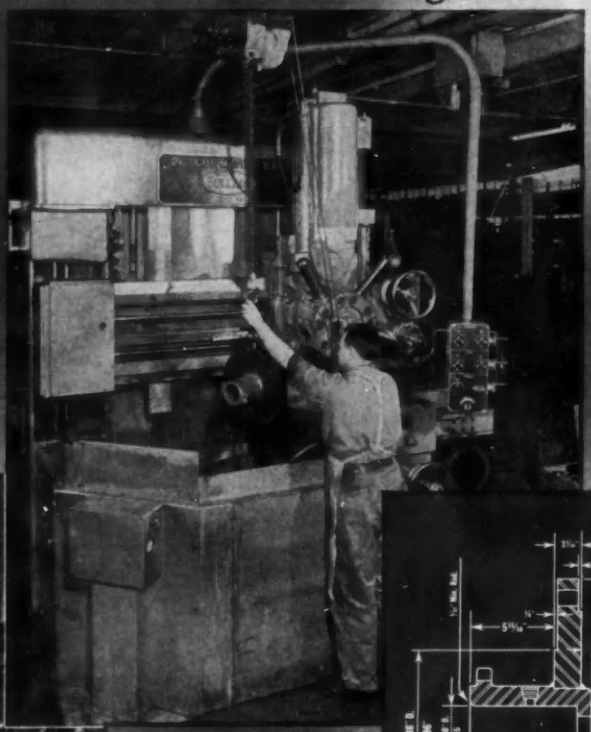
NEW BULLARD

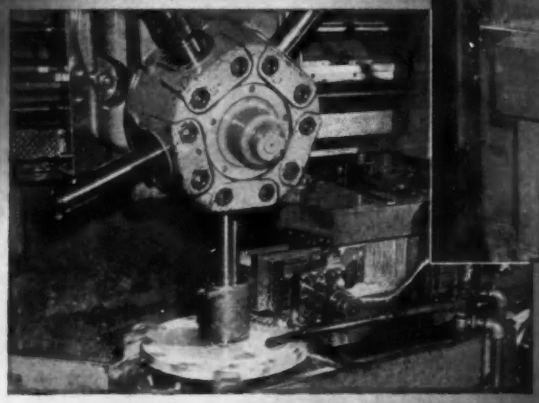
CUT MASTER V.T.L.

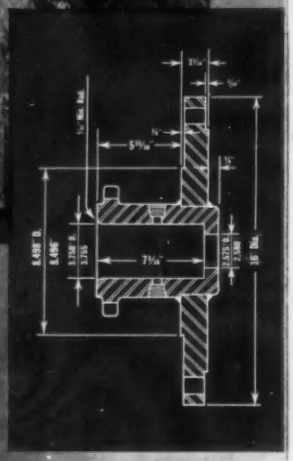
MODEL 75

25% reduction in machining time

Manufacturers of fluid mixing equipment for numerous applications in industry, Mixing Equipment Co., Inc., Rochester, New York, are enthusiastic in their acclaim of the performance of their new 26" Cut Master, Model 75.







Easier loading and chucking, greater capacity and accuracy, combined with ease of operation are the factors contributing to the increase in production according to Mr. Walter Schmidt, General Foreman.

Are you interested in applying these advantages to your manufacturing processes? If so, call your nearest Bullard Representative or mail coupon to

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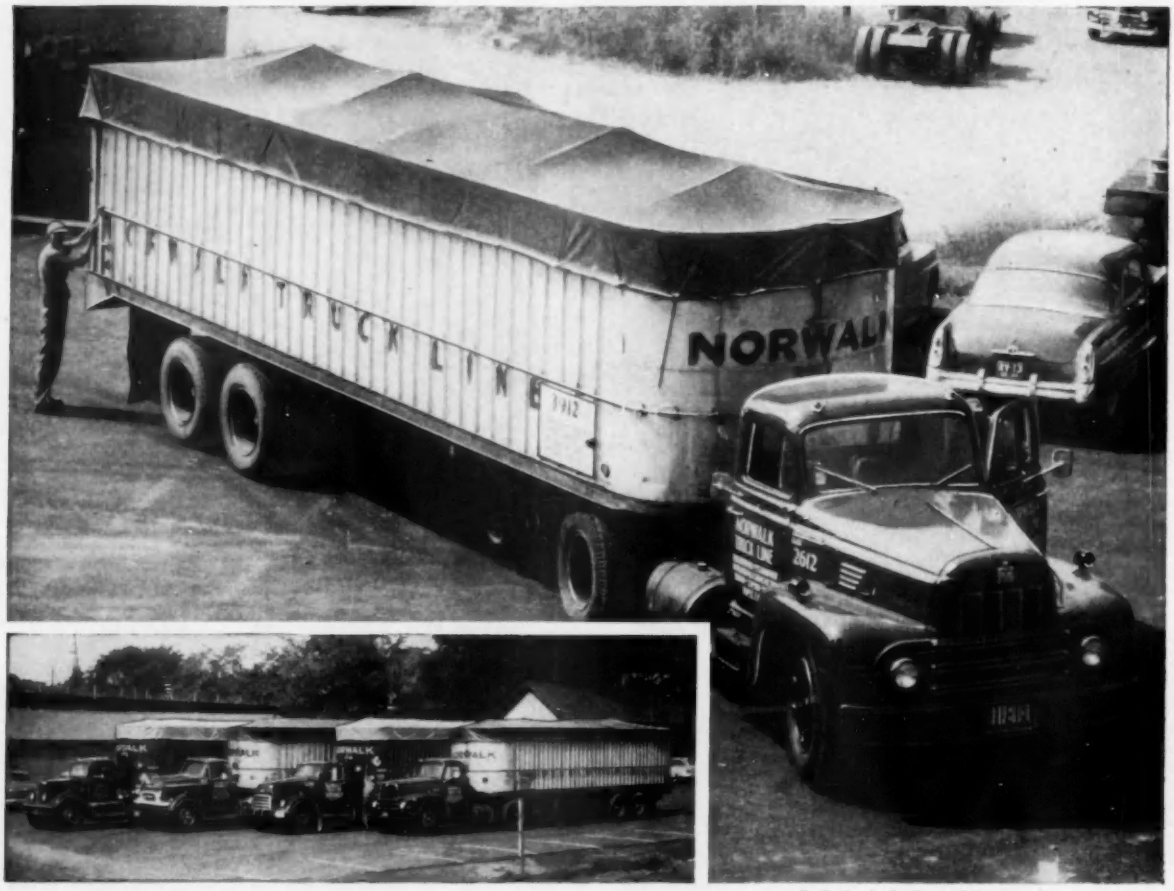
Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not make these tarpaulins. We supply only the Geon vinyl resin.

Lighter Tarp is tops with truckers

"MAKE it light," said truckers, "and you'll solve one of our big tarpaulin problems."

Conventional tarpaulins for open top trucks are heavy, hard to manage and not completely weatherproof. A manufacturer familiar with the versatile properties of Geon polyvinyl materials knew the answer to this problem. He coated tough nylon fabric with a plastisol based on Geon paste resin and produced a lighter, weather resistant tarpaulin that also resists the effects of grease, oil and mildew. No sewing is necessary—it's all electronically sealed.

Color is another bonus for the trucker. The Geon coating in bright colors reflects oncoming headlights for greater safety in night driving. It is also translucent, allowing daylight loading without artificial light.

This Geon coated tarpaulin may give you an idea for a new product, or increase the sales appeal of a present one. Geon materials cover a wide range of profitable uses from wire insulation to rigid pipe, foam, flooring, and many others. To find out more about specific advantages that Geon may offer your own operation, please write Dept. DA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

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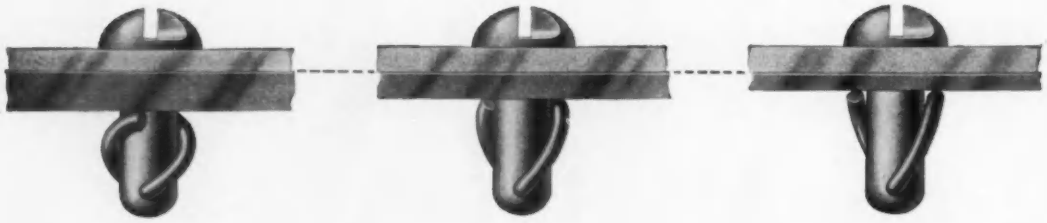

Spring-Lock—the easy-to-use removable fastener for modern designs—works whether panel thicknesses run over or under specifications! Spring wire deflects automatically to handle greater or lesser thicknesses. Spring-Lock's design flexibility makes it more than a fastener: it can be adapted as a shelf support, door strike, knob or any similar panel-mounted device. Many standard shapes and sizes of Simmons Spring-Locks are available from stock.

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1749 North Broadway, Albany 1, New York

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SPRING-LOCK
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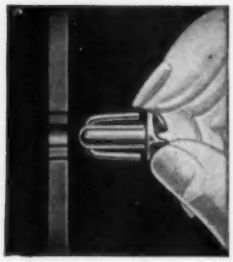
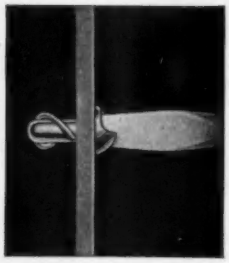
HERE'S HOW SPRING-LOCK WORKS



1. *Insert fastener.*



2. *Half-turn locks it in place.*

With production costs on the uptrend, you can figure on Spring-Lock as an assembly time and money-saver, because:

- **Installation is BLIND**
- **Installation is EASY: no special tools are needed**
- **Installation is QUICK: a half-turn locks it in place**
- **Installation is SECURE: the *spring* steel *locks* the fastener, resists vibration**

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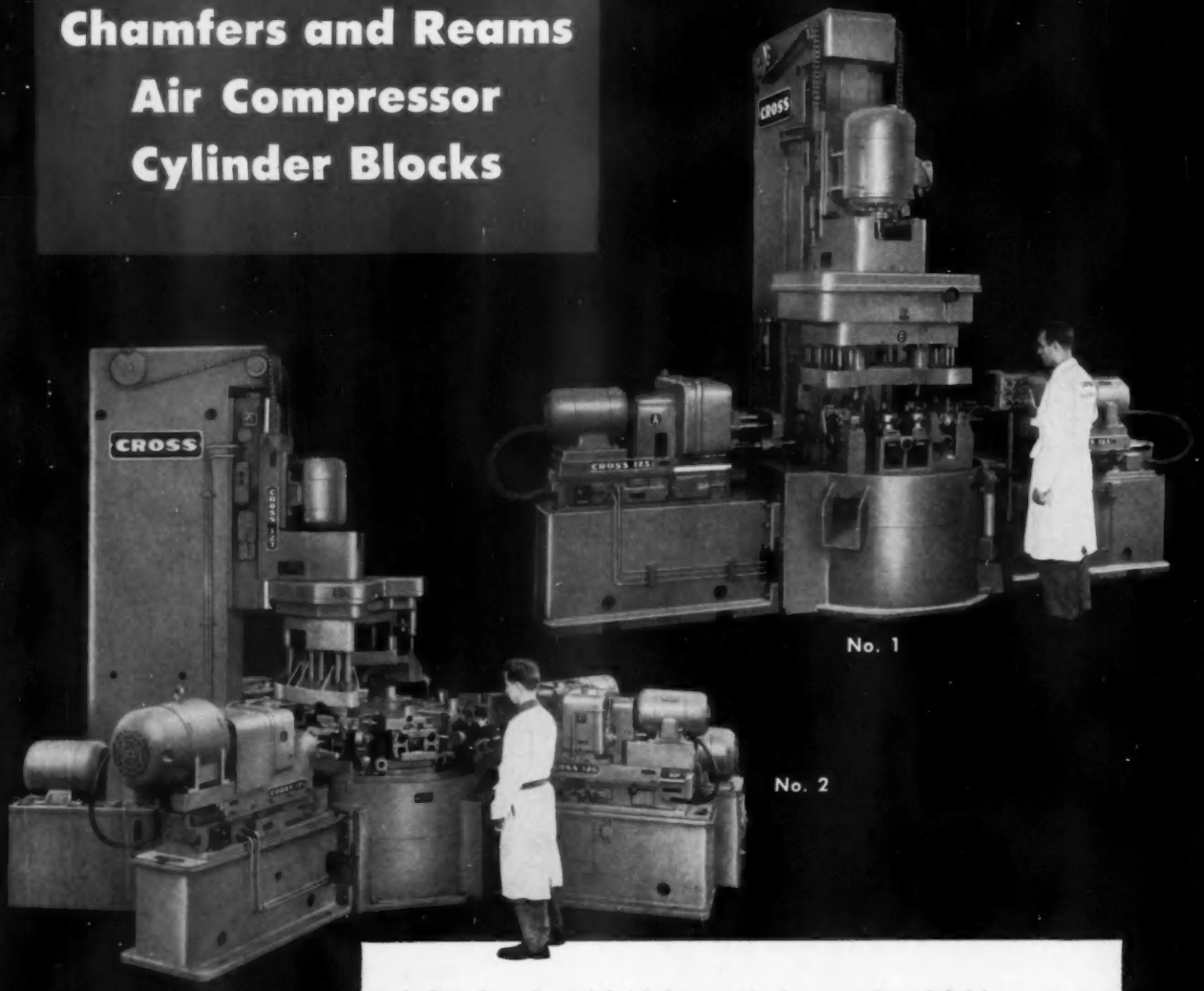
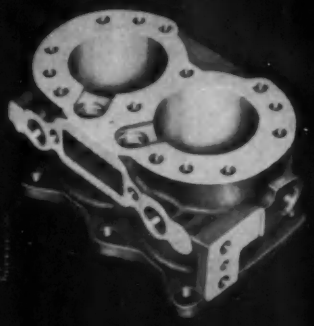
Welds readily . . . excellent for soldering and brazing

More Specials by Cross

Bores, Drills, Chamfers and Reams Air Compressor Cylinder Blocks





- ★ Rough and semi-finish bores cylinders; rough and finish counterbores valve ports; drills, chamfers and reams all holes.
- ★ 129 pieces per hour at 100% efficiency.
- ★ Machine Number One has 4 stations; 1 for loading, 3 for drilling, chamfering and reaming. Machine Number Two has 7 stations: 1 for loading and 6 for machining.
- ★ 2 position, progressive type work holding fixtures for both machines, each arranged to handle 6 similar parts.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance and flexibility for part design changes.
- ★ Other features: Construction to JIC standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic work cycle.

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DETROIT 7, MICHIGAN

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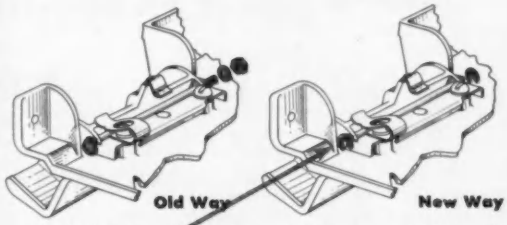
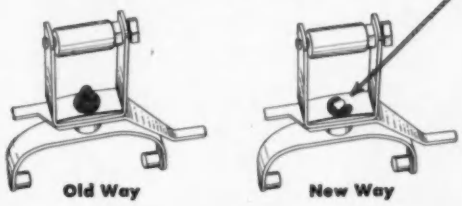
Edison engineers built this new dictating instrument for small size, light weight, and rugged performance. Waldes Truarc rings replace old fashioned fasteners, cut production costs; keep unit light, compact, and achieve faster more economical assembly.

Disc Lever Cover Assembly



Two Waldes Truarc E-Rings (Series 5133) replace nut, bolt, washer assembly, eliminate one component and assure precise alignment of parts. Truarc rings facilitate pivoting without binding. Production assembly time is decreased.

Lift Bracket and Fork Assembly



A single, easily assembled Waldes Truarc E-Ring (Series 5133) replaces nut-bolt-washer fastening. Free pivoting is assured, one component eliminated, labor and material costs reduced.

Clutch Plate Assembly

Two Truarc E-Rings eliminate staking operation, prevent damage to spring coil. Simple assembly operation speeds production, eliminates rejects, reduces labor and material costs.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today. Let our Truarc engineers help you solve design, assembly and production problems, without obligation.

For precision internal grooving and undercutting ... Waldes Truarc Grooving Tool!

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Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
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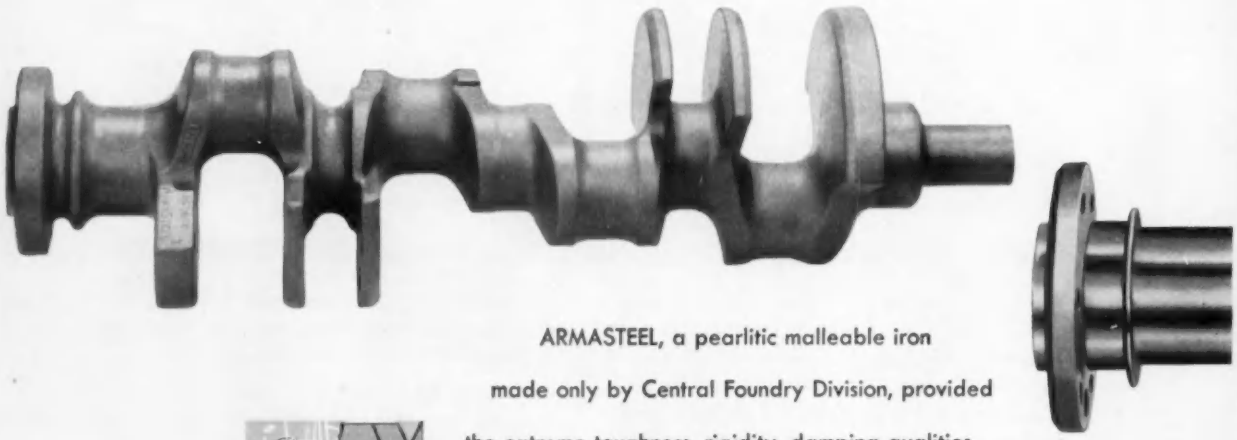
Name.....
Title.....
Company.....
Business Address.....
City.....Zone.....State.....

AY-058

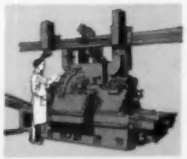
WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787. and other U. S. Patents pending. Equal patent protection established in foreign countries.

the step-by-step story of how ARMASTEEL shell-cast crankshafts saved machine time, tools, and labor for Pontiac Motor Division

After hundreds of hours of research and experimentation, the Pontiac Motor Division in 1955 began installing *cast* crankshafts in their automobiles, and in 1956 have completed a 100% conversion to castings. It was because of the combination of Central Foundry Division's amazing material, ARMASTEEL, combined with the new shell mold process that made this switch-over to cast crankshafts practical and profitable.



ARMASTEEL, a pearlitic malleable iron made only by Central Foundry Division, provided the extreme toughness, rigidity, damping qualities and all the other physical properties necessary for better crankshafts. And the superior machining characteristics of ARMASTEEL plus the close dimensional tolerances of the shell mold process made possible the substantial savings from one end to the other of the crankshaft finishing line. Take it step by step . . .



1

THE FIRST STEP IN MACHINING cast crankshafts at Pontiac is the milling of the driving pads. Where formerly they processed 80 steel crankshafts an hour on these milling machines, production has now been increased to 96 an hour on the ArmaSteel parts. A similar increase has been noted in tool life . . . during a two-week period of machining steel crankshafts, 336 cutters had to be ground, while in a two-week period when the crankshafts were ArmaSteel, only 153 cutters needed grinding.

2

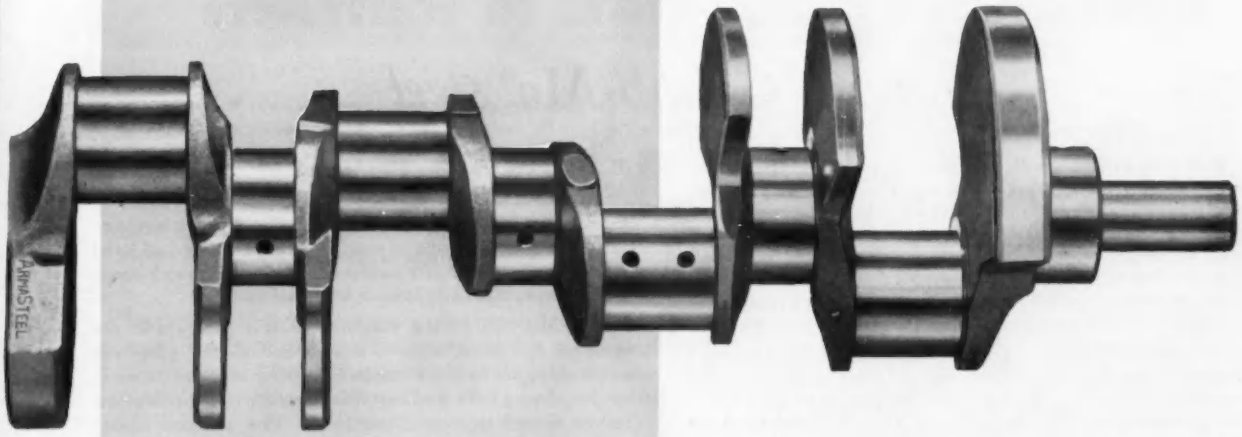
SECOND STEP IN THE PROCESS is the turning of all in-line diameters on crankshaft lathes. Here, it was found that the superior machineability of the ArmaSteel parts allowed lathe speed to be increased from 53 R.P.M. to 153 R.P.M., and that the rack-to-rack cycle time reduced from 2.75—3.00 minutes to 1.40—1.50 minutes, thus doubling output.

3

THIRD STEP is the rough grinding of main journals. Where steel forgings were ground at the rate of 32.5 per hour, 45 ArmaSteel cast crankshafts are being processed per hour. Grinding wheel life is substantially increased.

4

FOURTH STEP involves the rough turning of crankpins. Production has been speeded here from 24 steel parts to 46 ArmaSteel parts per hour, due partly to decreased stock to be machined.



5

FIFTH STEP is finish turning on the crankpins. Production has been more than doubled on this operation. Where 21 steel crankshafts per hour were processed, 46 of ArmaSteel are being turned.

6

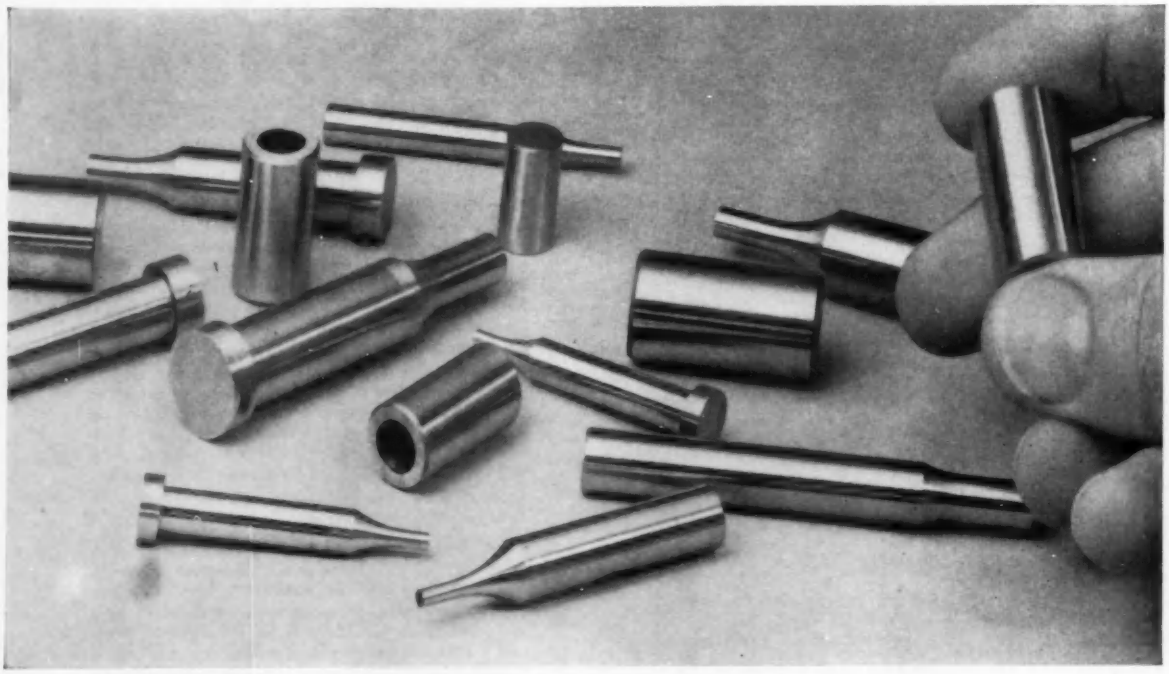
THE REMAINING OPERATIONS INCLUDE oil-hole drilling, finish grinding on main journals, straightening, and tapping of holes in the flywheel flange. In drilling oil holes, production men found that the need for retracting drills periodically for chip removal was eliminated by ArmaSteel. This helped speed output from 37.5 steel to 64 ArmaSteel parts per hour. Drills needing to be reground or replaced were only about ¼ as many with the cast crankshafts. One transfer drilling line has been discontinued, which allowed the elimination also of one lathe for turning OD of counterweights, and one straightening press, both of which were automated with the drill. Less straightening is necessary on the ArmaSteel castings, and finish grinding on main journals is faster than with steel. A greatly reduced number of taps are used in tapping the flywheel flange holes.

THUS, MACHINE TIME, TOOLS, LABOR, and long-range capitalization have all been decreased through the change to shell-cast ArmaSteel crankshafts. Performance of the part is excellent, and many new design possibilities have been opened up. This is likewise true of many other products that have taken advantage of ArmaSteel and Central Foundry Division's shell mold process. For information on how your product can also benefit, write today for your copy of the "ARMASTEEL" catalog and pamphlet "Shell Molding at Central Foundry".

CENTRAL FOUNDRY DIVISION

GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24

67



How the country's largest exclusive producer of punches and dies changed complaints to contracts

. . . with Graph-Mo® steel

PORTER Precision Products, Cincinnati, Ohio, is the country's largest exclusive manufacturer of punches and dies—37,000 different sizes in stock. Formerly, Porter produced these products from water-hardening and other high-carbon tool steels, but found that such steels presented distinct disadvantages. For example, they distorted in heat treating, were relatively expensive and difficult to machine, and did not meet customers' demands for longer life.

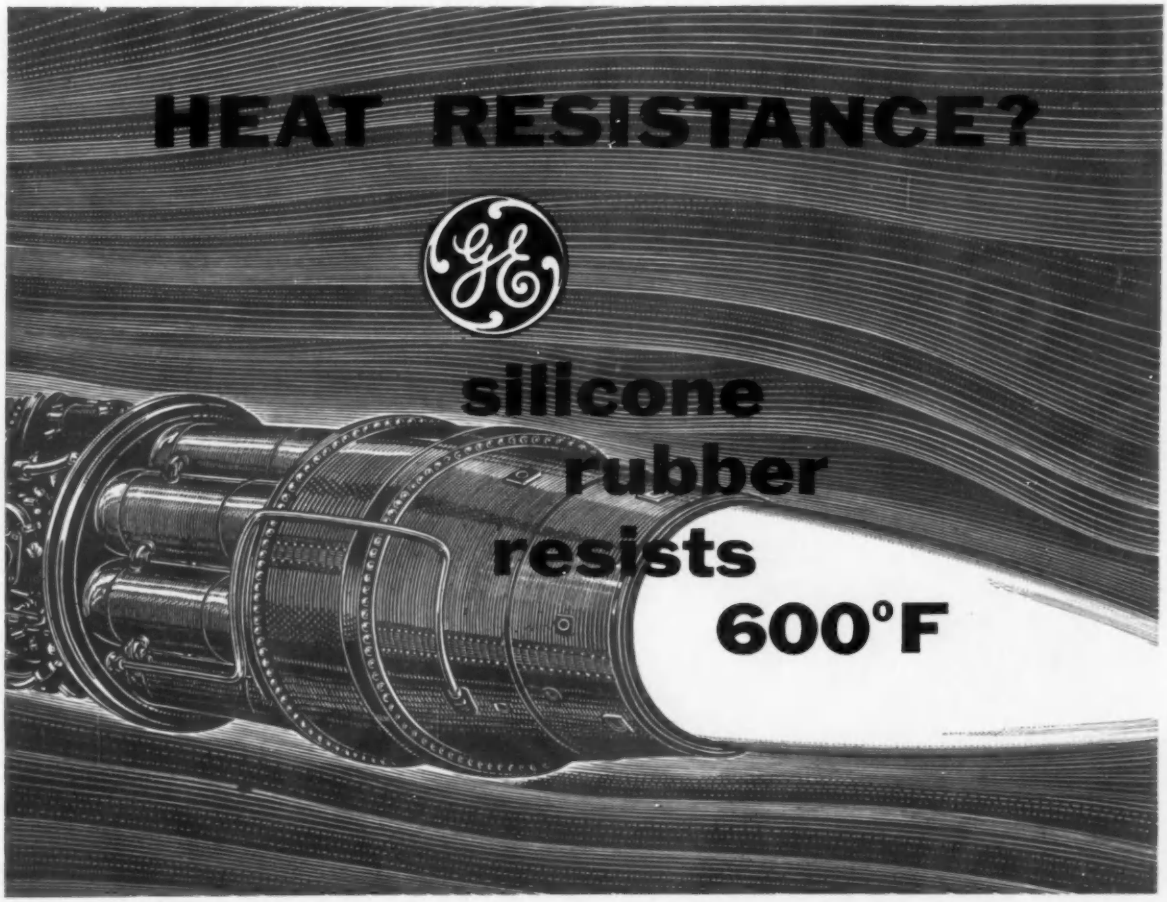
With a view to correcting these problems, Porter engineers adopted Graph-Mo®—one of four graphitic tool steels developed by the Timken Company—as a standard for the manufacture of punches and die buttons. Because it contains free graphite, Graph-Mo is easier to machine. And punches and dies made of Graph-Mo don't scuff or gall. From every aspect, Porter's adoption of Graph-Mo steel has proved eminently successful.

Graph-Mo outwears ordinary tool steels on an average of three to one. Millions of tiny particles of diamond-hard carbide—one of the most wear-resistant substances known—give Graph-Mo steel longer service life.

Graph-Mo may be the solution to *your* punch and die problems. For more information about all four graphitic steels developed by the Timken Company, and their uses in dies, punches, gages, and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



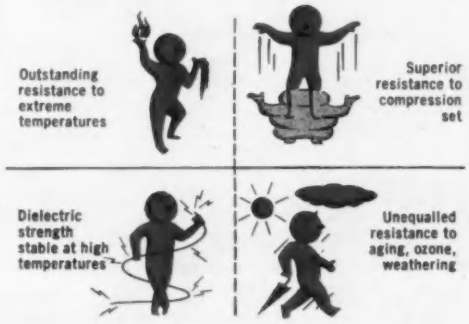
Looking for *really* heat-resistant rubber? General Electric's Class 700 silicone rubber offers serviceability *up to 600 F!* That's why it's being used for aircraft ducting and oven door seals subject to *intermittent* temperatures of 600 F. And it provides *continuous* service at 300-500 F as seals and gaskets in jet engines, diesel engines, clothes dryers, electric cookers, steam irons and heat sealing equipment.

Where can YOU use G-E silicone rubber?

There's a kind for almost every requirement, classified according to dominant property for easy selection and specification. For example: Class 300 offers the best recovery after compression *of any known rubber!* Class 500 provides flexibility *at 150 F below zero!* Which class is best for *you?*

For more details on G-E silicone rubber, see your "Sweet's Product Design File."

G-E silicone rubber provides...


Outstanding resistance to extreme temperatures
Superior resistance to compression set
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Unequalled resistance to aging, ozone, weathering

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Please send me, at no obligation, technical data on G-E silicone rubber, including a newly revised "Lightning Selector" and up-to-date list of fabricators

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MALLORY

These contacts, for a utility circuit breaker, look alike . . . but one costs only half as much as the other, as a result of consultation with Mallory Contact Specialists.

How Mallory Contact Engineering Balances Performance and Price

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** . . . in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

CONTACTS can be *too good* for their intended service. Detailed study of a contact application, by Mallory engineers, often uncovers ways to design more closely to actual requirements . . . at substantial savings to the customer.

The contact pictured above is a typical example. Intended for use in a circuit breaker for utility distribution lines, it originally was designed with contacts made of heavy-duty silver ELKONITE®. At first glance, this exceptionally long-wearing, high conductivity metal appeared ideal to meet the customer's original specifications. But further investigation by Mallory contact engineers revealed that while contacts had to operate with absolute dependability, they did not have to function *frequently*.

On the basis of the actual frequency of service expected, Mallory engineers recommended a change to a copper ELKONITE . . . an alloy made of lower priced materials, and more economical to produce. Overall savings to this customer amounted to a 50% cut in contact costs. Moreover, there is no sacrifice in performance for the specific application.

Chances are that consultation by Mallory on your own contact applications can prove the source of interesting savings for you. Mallory engineers are well qualified by years of experience to analyze your requirements, to recommend materials from the extensive line of Mallory alloys, and to assist in overall design of contacts and assemblies. For a discussion, write or call Mallory today.

Serving Industry with These Products:

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Expect more . . . get more from

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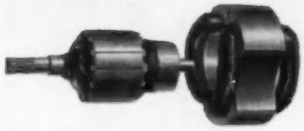
Black & Decker® "95" VACUUM CLEANER IS POWER-BUILT for all-purpose cleaning!

Compactness, versatility and power make the B&D #95 Vacuum Cleaner the finest heavy-duty, all-purpose cleaner for wet or dry industrial use.

The self-contained B&D #95 Vacuum Cleaner rolls easily over rough floors on casters. An extra flexible 15-foot hose reaches out-of-the way spots. You can quickly and easily empty the unit's dirt compartment.

Also available for lighter use, the B&D #65 Vacuum Cleaner delivers 70% - 100% more cleaning power than any comparable unit. A handy Accessory Carrier saves time and steps. For more details on B&D Vacuum Cleaners, see your B&D distributor or write: THE BLACK & DECKER MFG. CO., Dept. 1605, Towson 4, Md.



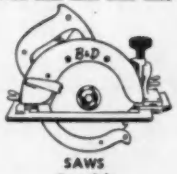
We don't buy motors – we build them!

The *heart* of your electric tool is the motor — completely built by Black & Decker! All the power you need *and then some* — because each motor is built for a specific tool and the job it must do! B&D motors always *stand up!*

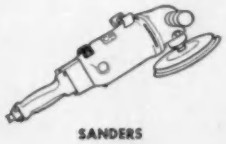
LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

B&D Black & Decker®
PORTABLE ELECTRIC TOOLS

SERVICE! ... one of 43 Black & Decker factory service branches is located "next door" to you to give fast, efficient service and genuine replacement parts.



SAWS
5 models



SANDERS
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SCREW DRIVERS
21 models

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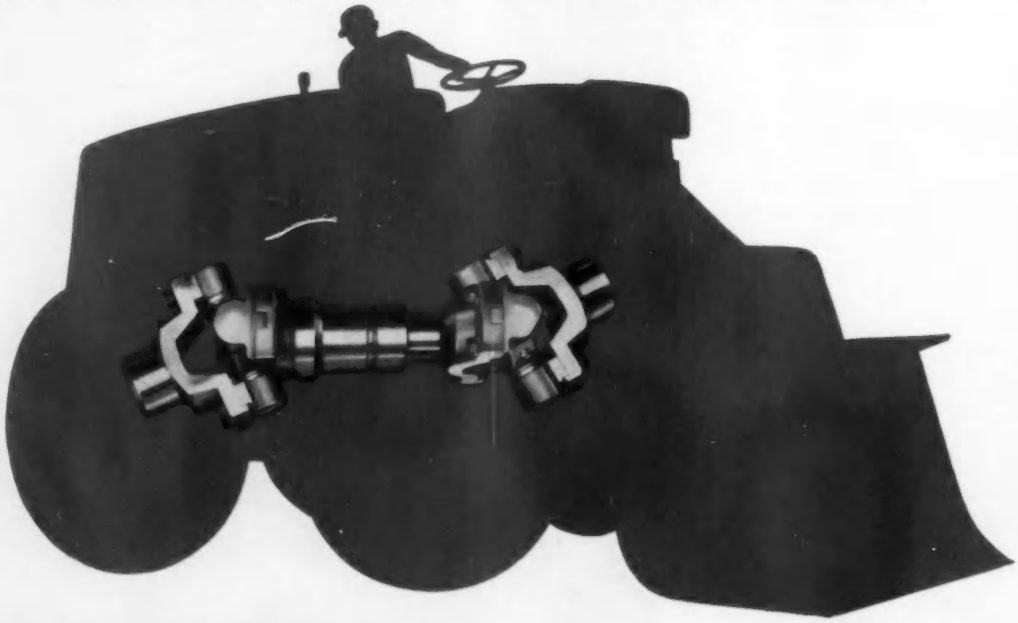

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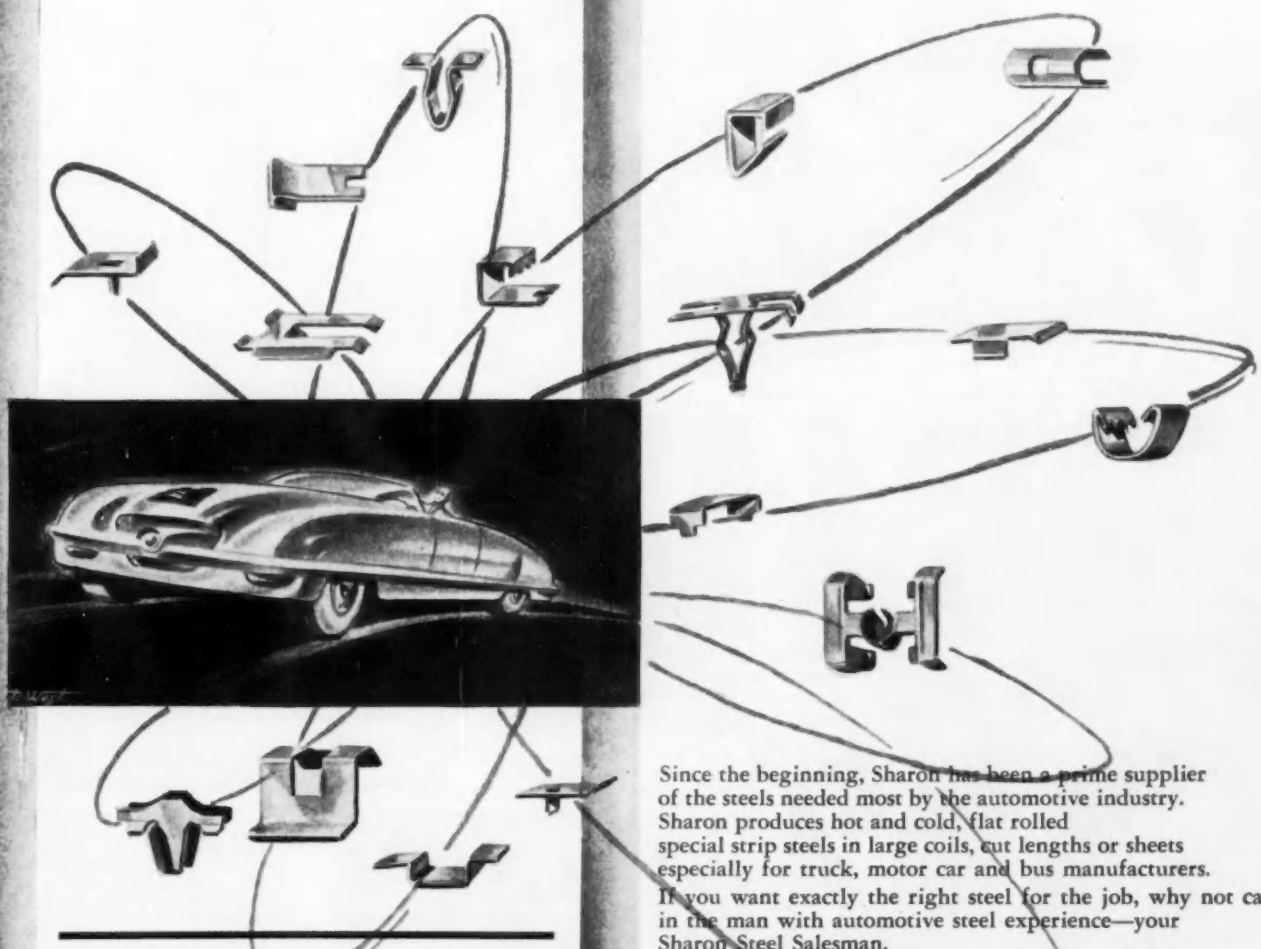

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GALVANITE* — The story of one of the most popular hot dip zinc coated steels.

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both straight chrome and chrome-nickel

SPRING STEELS
of every analysis

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the steel with the rolled-in design surface

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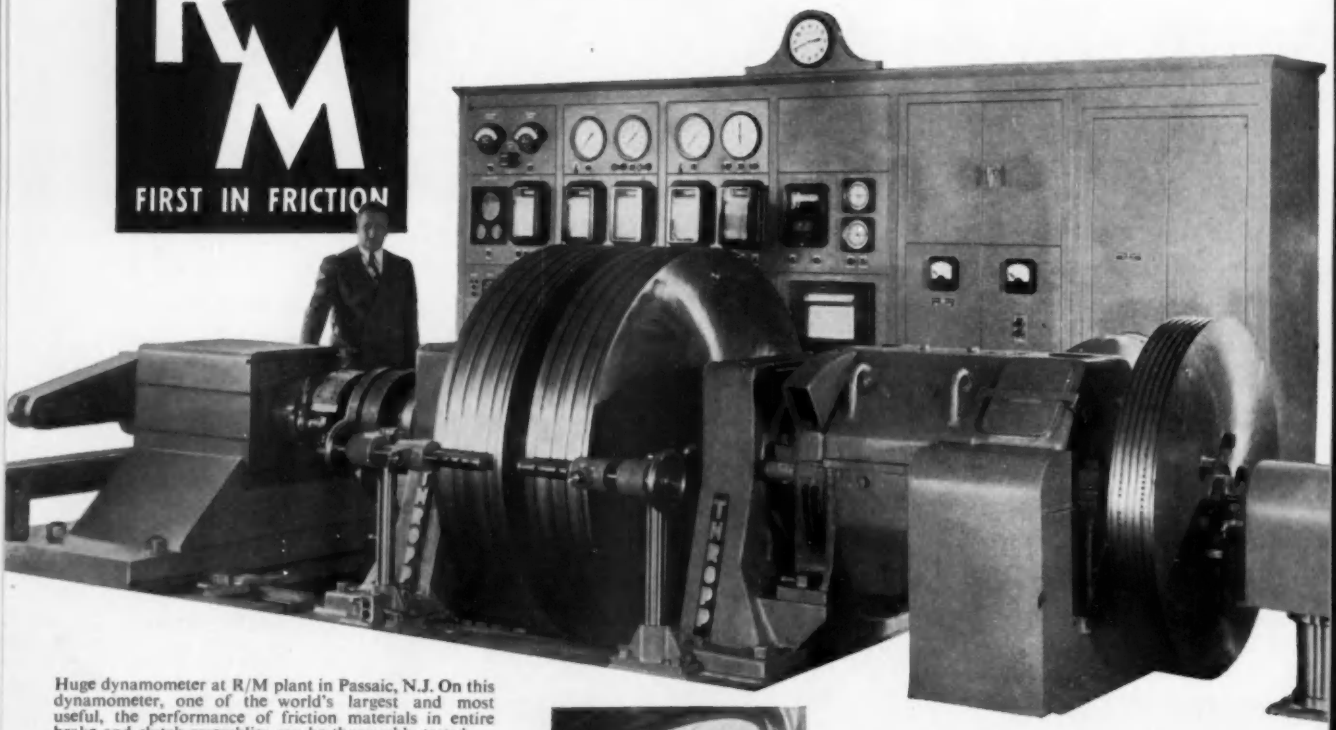
HOW R/M ENGINEERING SETS

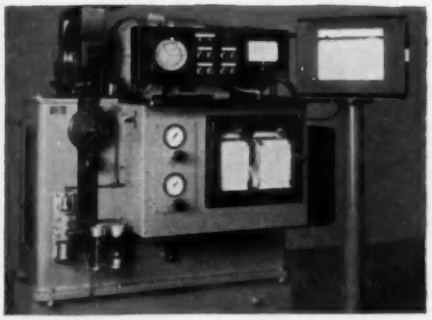
R/M
FIRST IN FRICTION



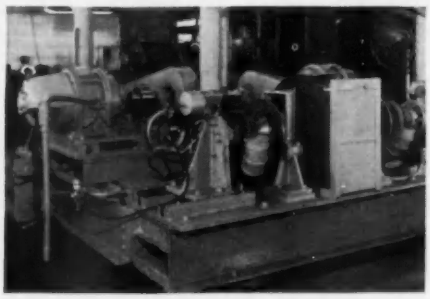
Huge dynamometer at R/M plant in Passaic, N.J. On this dynamometer, one of the world's largest and most useful, the performance of friction materials in entire brake and clutch assemblies can be thoroughly tested.

R/M maintains a permanent testing station near Jennerstown, Pa., along U.S. Route 30, considered to be the most severe mountain course of its kind in the U.S.A.

Cab of one of the special R/M trucks used in road testing brake linings and clutch facings.



R/M testing machine at plant in Passaic. On R/M dynamometers, a special Uni-Tork valve, invented by R/M and since adopted by the S.A.E., subjects brakes to a uniform rate of deceleration by continuously and automatically varying pressure to compensate for natural changes in frictional characteristics of material being tested. This valve helps produce test data much more closely related to actual field operating conditions than possible heretofore.



Duplex dynamometer at R/M plant in Bridgeport, Conn., used to run passenger car and other light duty brake tests. Four tests can be conducted simultaneously.

THE RECORD OF "FIRSTS" IN FRICTION MATERIAL DEVELOPMENT SHOWS WHY R/M IS FIRST IN FRICTION

FIRST Woven Brake Lining • FIRST Asbestos Brake Lining • FIRST Ground Wearing Surface • FIRST Zinc Alloy Wire Brake Lining • FIRST Pre-Treated Yarns • FIRST Extruded Pulp Brake Lining • FIRST Flexible Pulp Brake Lining in Rolls • FIRST Dry Process Brake Lining • FIRST Semi-Metallic Brake Lining • FIRST Bonded-to-Metal Brake Lining • FIRST Woven Clutch Facings • FIRST Molded Asbestos Clutch Facings for Clutches Operating in Oil FIRST Endless Woven Clutch Facings • FIRST Pre-Treated Clutch Facings • FIRST Bonded-to-Metal Clutch Facings

THE PACE IN FRICTION MATERIAL DEVELOPMENT

THE WORLD'S MOST COMPLETE

TESTING

ASSURES CUSTOMER SATISFACTION

Friction is an elusive phenomenon. To predict and control the performance of friction materials in new applications or combinations—particularly with today's precise operating requirements—is almost impossible except by actual proving on a vehicle or on a dynamometer.

That's why Raybestos-Manhattan, for over 50 years the world's largest maker of friction materials, has the world's most complete, most adaptable facilities for testing friction materials—both in the laboratory and on the highway.

Much of this test equipment was actually designed by Raybestos-Manhattan. In 1938, for example, R/M developed the first dynamometer ever made for the specific purpose of testing friction materials operating in oil.

R/M was the first to chart the properties of friction material operating in oil at speeds up to 18,000 rpm.

R/M dynamometers range from comparatively simple machines to giant inertia dynamometers—including one of the world's largest—on which customers' complete brake and clutch parts can be tested so as to bring out inherent design factors, such as servo, wrapping, distortion, and expansion due to heat.

There are certain factors—character of engagement, for example—that cannot be accurately evaluated in the laboratory. R/M therefore maintains its own vehicles for road testing brake linings, clutch facings and other friction parts under actual operating conditions—and on both level and high mountain country. At the well-known Jennerstown Mountain Testing Area, R/M maintains a year-round testing station where friction parts can be subjected to rigid tests under the most rigorous driving conditions . . . on grades up to 15%.

WHAT DOES THIS R/M TESTING MEAN TO THE O.E.M.?

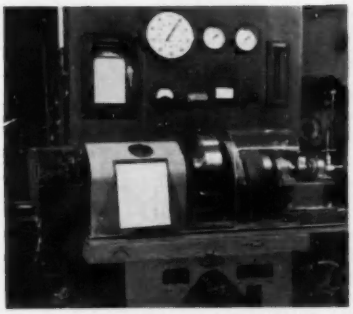
It means, first, that friction material performance in full size brake and clutch assemblies of trucks, airplanes, buses, trains, off-highway equipment, and passenger cars may be thoroughly and accurately explored for you by R/M engineers.

It means, second, that R/M has acquired knowledge of the behavior of friction materials under a wide range of operating conditions that provides exact answers to problems you may be facing now.

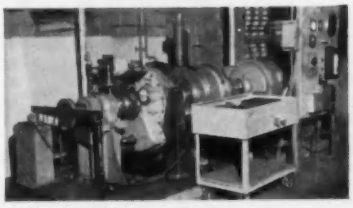
Unlike most other manufacturers, Raybestos-Manhattan works with all kinds of friction materials—from woven and molded asbestos to cork-cellulose and sintered metal. Consequently you are assured of the *best and most unbiased advice* on friction materials when you call in an R/M engineer.

If you are working with friction materials—and wish to make that work more productive and more profitable—consult with an R/M representative. All of R/M's experience in friction and the complete facilities of its seven plants—with their research and testing laboratories—are as near as your telephone.

Friction material fade and wear characteristics are tested on this Long clutch machine at R/M plant in Manheim, Pa. Two clutch tests can be performed simultaneously here.



Transmission dynamometer at Bridgeport developed by R/M for complete testing of automatic transmission plates.



Heavy duty master wet clutch dynamometer at R/M plant in Crawfordsville. This dynamometer was built to test plates for the master clutch of a heavy-duty tractor. Speed and torque can be varied to match all service conditions a tractor will encounter.

Heavy-duty inertia dynamometer at R/M plant in Bridgeport used for special testing. Aircraft landing and take-off conditions, for example, can be approximated on this machine—with brake temperatures rising from 0° to 1500°F in 6 seconds.

Write for your free copy of R/M Bulletin No. 500. Its 44 pages are loaded with practical design and engineering data on all R/M friction materials.

RM

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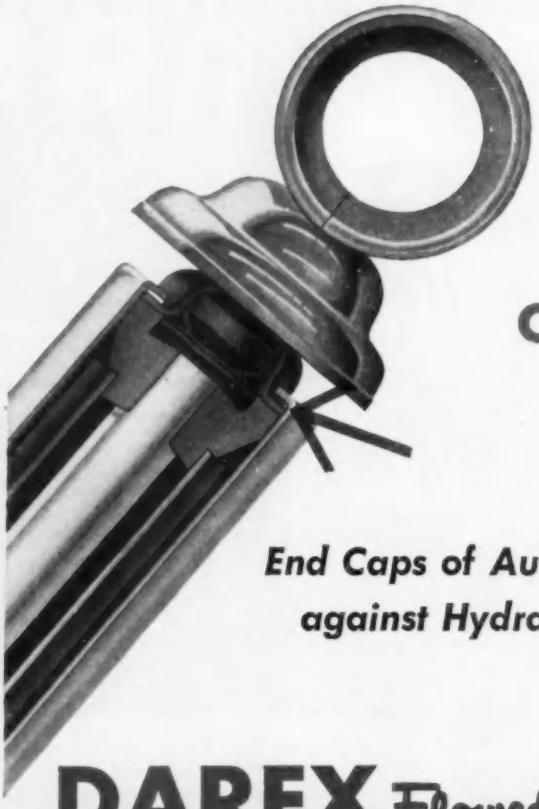
Asbestos Textiles • Laundry Pads and Covers • Packings • Abrasive and Diamond Wheels • Bowling Balls



Sealed Tight ...without costly welding!

End Caps of Auto Shock Absorbers now Sealed against Hydraulic Pressure and Leakage by

DAREX Flowed-in Gaskets

COMPOUND: N779

One of several standard DAREX "Flowed-In" compounds now being used by the automotive industry

Base	Neoprene
Heat Resistance	good to 300°F
Oil Resistance	excellent
Gasoline Resistance	good
Permanent Set	30-35% ASTM Method B
Color	brown
Consistency — Wet	thick paste
— Dry	rubbery, Shore A hardness 30
Production Rate	
— Automatic	80/min
— Semi-Automatic	40/min
Vulcanizing Time	5 — 10/min
Uses:	Wherever gaskets must seal against oil leakage or pressure, as on electric motor bearing caps.

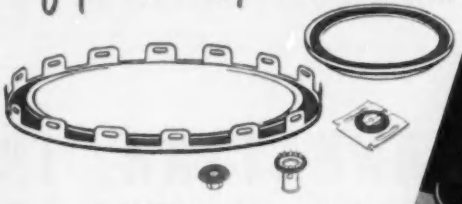
Automotive parts manufacturers, who had used electric welding to seal shock absorber end caps, are now saving thousands of dollars yearly by using the new DAREX "Flowed-in" Process.

Dewey and Almy engineers, after studying the problem, recommended "Flowed-in" gaskets with a DAREX compound. This gasketing material is flowed into place as a liquid, then vulcanized to form a solid, rubbery seal that is unaffected by oil under heavy pressure and temperatures up to 300°F.

End caps are now gasketed and cured, automatically, on a sub-assembly line, doing away with the costly welding process in final assembly line. Production has increased. The overall cost of sealing is much less. Rejects due to "leakers" have been practically eliminated.

Perhaps the DAREX "Flowed-in" Process can increase production or quality of *your* product. And at the same time lower labor and materials costs. If you have a problem involving a circular gasket, cushion, seal, or vibration dampener—send today for the DAREX "Flowed-in" Gasket Brochure illustrated below.

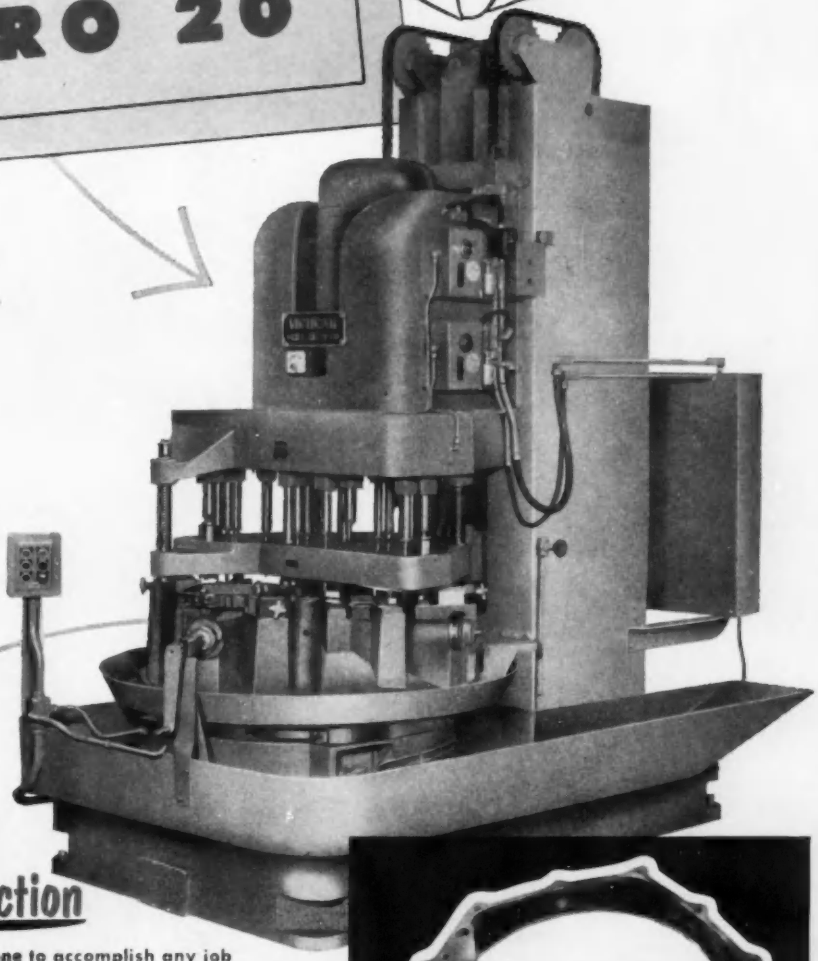
If you make parts like these—



discover what DAREX "Flowed-in" Gaskets can do for you. Write for this brochure *today!*

DEWEY and ALMY
Chemical Company
DIVISION OF W. R. GRACE & CO.
Cambridge 40, Mass.

MICHIGAN HYDRO 20

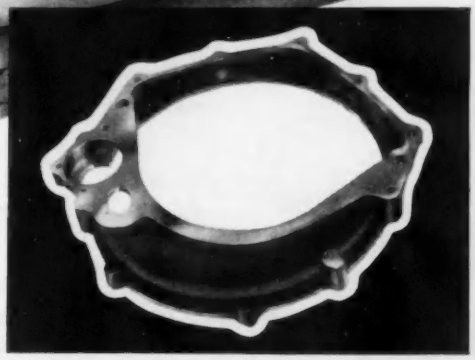


Tooled Up To...

DRILL, REAM
CHAMFER
ROUGH BORE
FINISH BORE
100 FLY WHEEL HOUSINGS PER HOUR

For Faster, More Economical Production

- Rugged column forms firm backbone to accomplish any job
- High strength to power ratio
- Automatically lubricated throughout
- Drill head mist lubricated
- Indicator (mounted at the front) protects motor from overloads
- Fixture mounted on Michigan 4-station 42" hydraulic index table



We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic

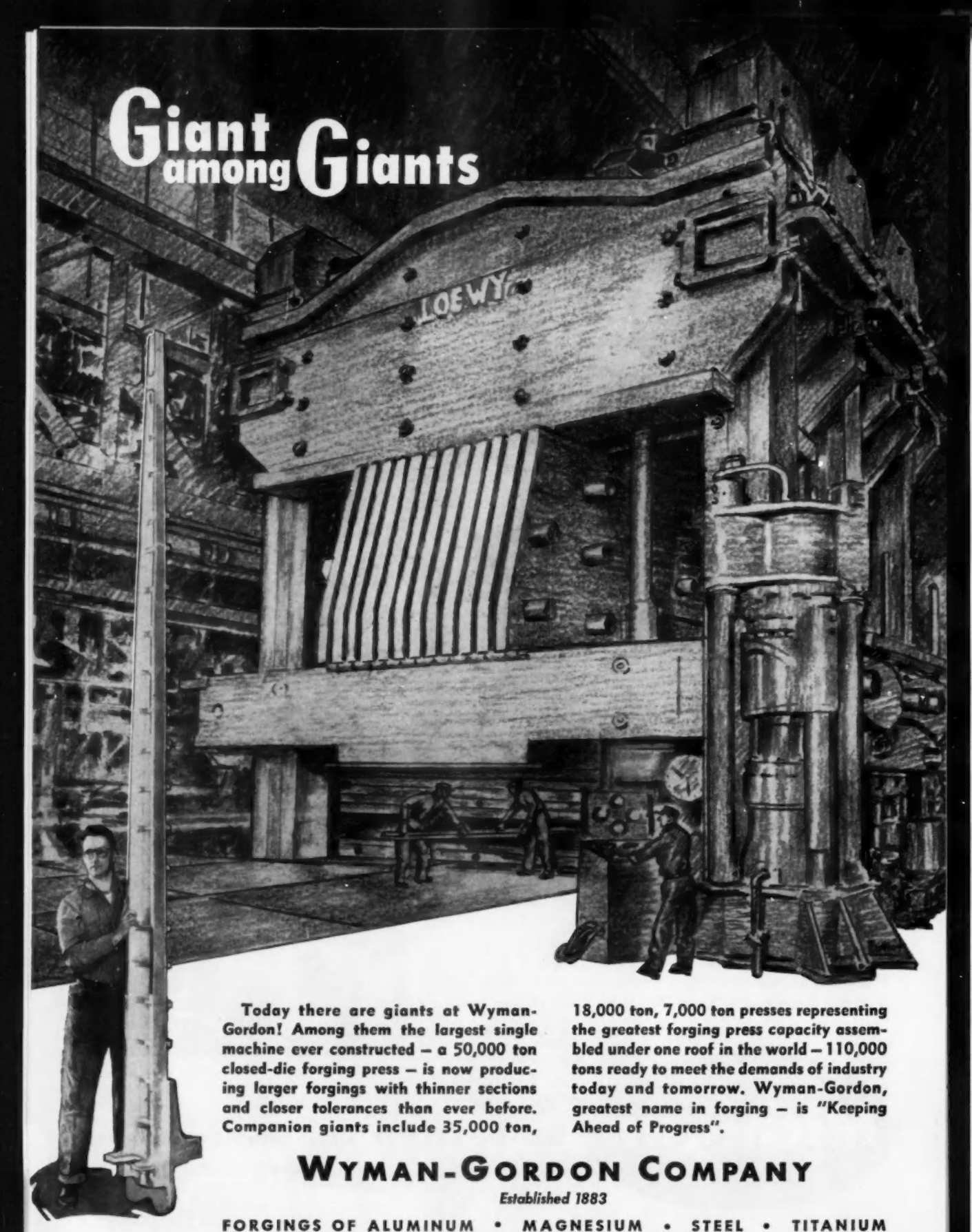
Four other sizes available

Hydro—3 Hydro—10
Hydro—5 Hydro—30

Michigan DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

Giant among Giants



Today there are giants at Wyman-Gordon! Among them the largest single machine ever constructed – a 50,000 ton closed-die forging press – is now producing larger forgings with thinner sections and closer tolerances than ever before. Companion giants include 35,000 ton, 18,000 ton, 7,000 ton presses representing the greatest forging press capacity assembled under one roof in the world – 110,000 tons ready to meet the demands of industry today and tomorrow. Wyman-Gordon, greatest name in forging – is "Keeping Ahead of Progress".

WYMAN-GORDON COMPANY

Established 1883

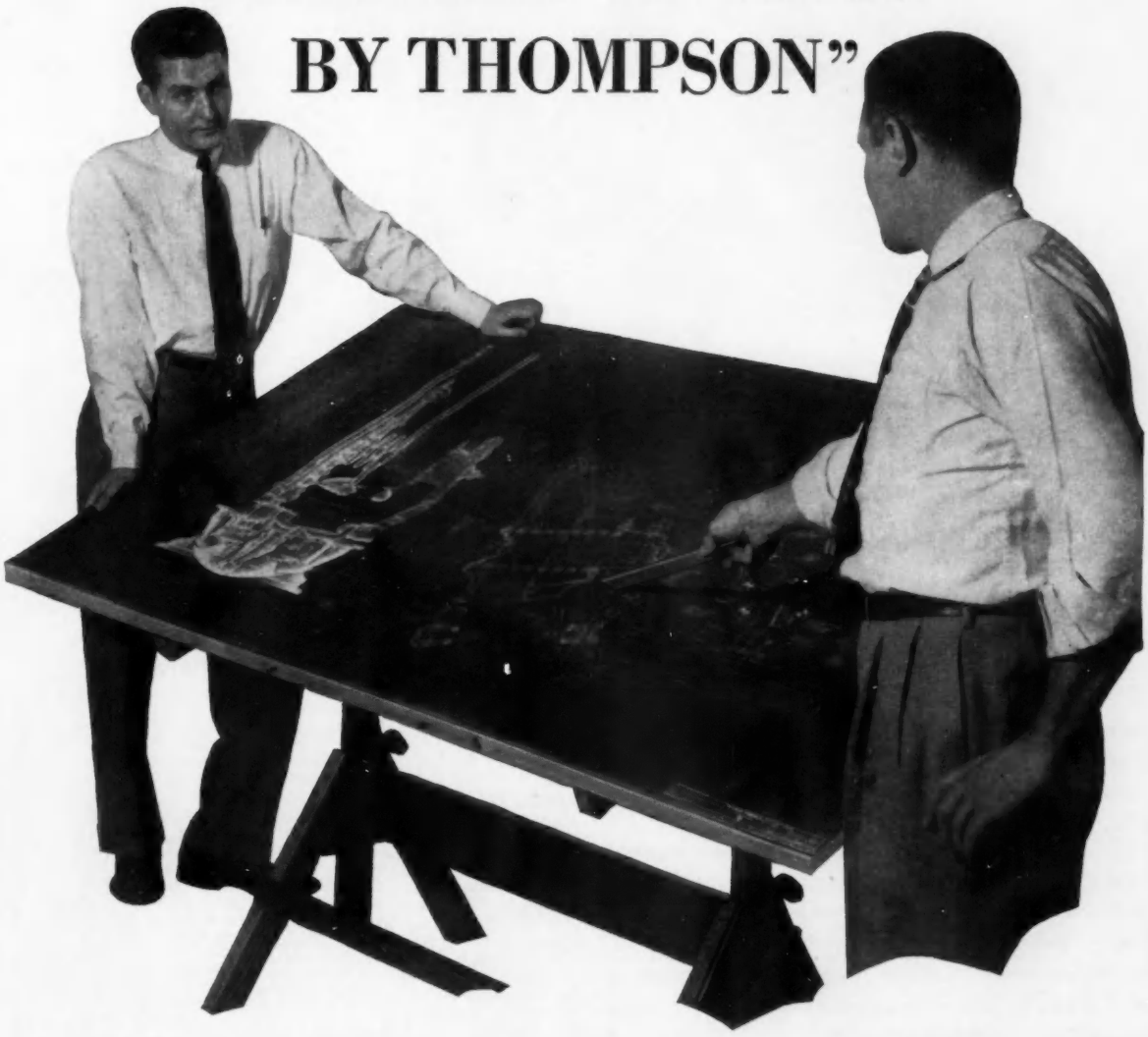
FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER 1, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

"Let's be sure to specify

STEERING LINKAGE BY THOMPSON"



MORE and more automotive manufacturers today specify "Steering Linkage by Thompson" when designing and planning their cars, trucks, buses and tractors of tomorrow.

And for good reason—for they've learned that "You Can Count on Thompson" as a dependable source of supply. And they've learned, too, to count on Thompson for important developments in ball joint design, for steering linkage, as well as other applications. Thompson's steering linkage units are in yesterday's cars and today's cars. And they'll be in tomorrow's cars, too.

Typical of these developments is the revolutionary Thompson-engineered front suspension ball joints, the greatest advance in automotive front suspension in 20 years. For over 50 years Thompson has played an important role in the automotive world.

If you use steering linkage assemblies, specify "Steering Linkage by Thompson". For details on how Thompson's skilled steering engineers can help you with your steering linkage developments, write, wire or phone Thompson Products, Inc., Michigan Div., 7881 Conant Ave., Detroit 11, Michigan, WA 1-5010.

Thompson Products

MICHIGAN DIVISION

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ELIMINATE THE WORK HAZARDS
OF CHROMIC ACID MIST AND SPRAY

. . . use ZERO-MIST

The health hazard caused by mist and spray from chromic acid plating bath solution is eliminated when you use Udylite's Zero-Mist. Employees like it. City and state labor and health authorities like and recommend it. It is a boon to labor relations.

Beside eliminating mist and spray and improving working conditions, there are these direct benefits to your profitable operations—Saving the losses of valuable chromic acid in mist and spray—Additional large savings in the reduction of dragout losses—No need for water wash system installations—Gives added life to ventilating systems—Protects other solutions from mist and spray contamination.

Zero-Mist is a stable, surface-active additive for decorative chromium plating baths. It is unaffected by high temperatures. The concentration of Zero-Mist stays practically constant.

Zero-Mist is today a *must* in many plating operations. It will pay you to try it. Write us today for a test sample.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST
PLATING SUPPLIER

CALENDAR

OF COMING SHOWS AND MEETINGS

AFS Castings Congress and Show, Atlantic City, N. J. ..... May 3-9

Third Annual Conference for Engineers, Ohio State Univ., Columbus, O. ..... May 4

Sixth Highway Transportation Congress, Hotel Mayflower, Washington, D. C. ..... May 8-10

AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y. ..... May 8-11

Western Material Handling Conference and Equipment Show, Los Angeles, Calif. ..... May 9-11

Mechanical Handling Exhibition and Convention, Earls Court, London, England ..... May 9-19

Design Engineering Show, Convention Hall, Philadelphia, Pa. May 14-17

Industrial Nuclear Technology Conference, Chicago, Ill. ..... May 15-16

Society for Experimental Stress Analysis, spring meeting, William Penn Hotel, Pittsburgh, Pa. ..... May 16-18

National Industrial Conference Board, annual meeting, Waldorf-Astoria Hotel, New York, N. Y. ..... May 17-18

Automotive Advertisers Council, spring meeting, Homestead, Hot Springs, Va. ..... May 22-25

National Fluid Power Association annual meeting, Greenbrier, White Sulphur Springs, W. Va. May 28-30

Indianapolis 500-Mile Race ..... May 30

AGMA Annual Meeting, Homestead, Hot Springs, Va. ..... June 3-6

SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ..... June 3-8

Material Handling Institute 1956 Exposition, Public Auditorium Cleveland, O. ..... June 5-8

American Society for Quality Control, annual convention, Montreal, Canada ..... June 6-8

Seventh National Plastics Exposition, Coliseum, New York, N. Y. June 11-15

Society of the Plastics Industry, conference and annual meeting, Commodore Hotel, New York, N. Y. ..... June 11-15

National Truck, Trailer and Equipment Show, Los Angeles, Calif. June 14-17

ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ..... June 17-22

International Machine Tool Exhibition, London, England. June 22-July 6

Drop Forging Association, annual meeting, The Homestead, Hot Springs, Va. ..... June 24-27

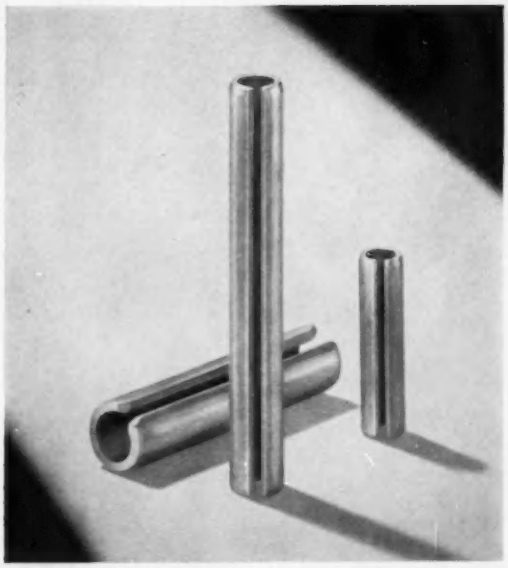
Machine Tool Builders' Sales Conference, Purdue Univ., Lafayette, Ind. ..... July 30-Aug. 3

SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. ..... Aug. 6-8

American Association of Motor Vehicle Administrators, annual conference, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada ..... Aug. 21-24

International Ignition Conference, sponsored by Scintilla Div. of Bendix Aviation Corp., Sidney, N. Y. ..... Aug. 22-24

Eliminate Tapping, Peening, Milling with Sel-Lok Spring Pins



SEL-LOK spring pins are made of alloy steel, heat treated for uniform toughness and long-lasting spring action. Ends are tapered to make driving easy; edges of axial slot are rounded to prevent scoring of drilled holes.

Versatile self-locking fasteners reduce assembly, maintenance time

SEL-LOK spring pins materially reduce production costs, because you can install them in plain drilled holes with either hand or automatic assembly tools. They eliminate expensive close-tolerance tapping, reaming, peening and milling operations, and the associated rejects and waste.

Use **SEL-LOK** spring pins as axles, keys, hinge pins, cotter pins, pivot or stop pins. Use them to secure gears to shafts or to assemble universal joints or complex mechanical linkages. Once you've installed them, they stay put. They resist vibration and shock, because the hollow split tube flexes to absorb impact or shearing stresses. And you can remove them easily with a drift pin or punch. Since they spring back to original diameter when removed, they can be reused again and again without losing locking efficiency.

SEL-LOK spring pins are stocked by your authorized industrial distributor. See him for details. Or write us for Bulletin 2014 and samples, or for information about any problem you think these easy-to-use pins might solve for you. Sel-Lok Spring Pin Division, Standard Pressed Steel Co., Jenkintown 53, Pa.

SEL-LOK SPRING PIN DIVISION

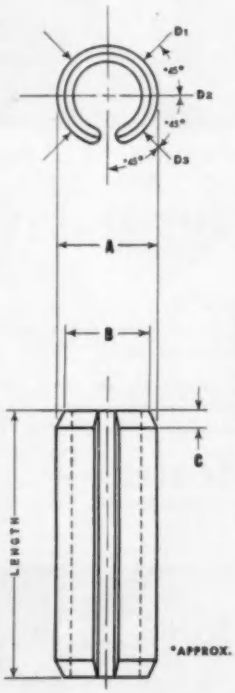
STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

SEL-LOK spring pins in standard sizes are available at your authorized distributor's. Consult SPS for special sizes, materials and finishes.

SPECIFICATIONS



A			B	C	WALL THICKNESS	RECOMMENDED HOLE SIZE		MIN. DOUBLE SHEAR STRENGTH IN POUNDS (STANDARD PIN CARBON STEEL)
NOMINAL PIN DIA.	MAXIMUM DIA. (GO RING GAGE)	MINIMUM DIA. 1/3 (D1+D2+D3)	MAX.	NOM.	S STANDARD	MIN.	MAX.	
.062	.069	.066	.059	.011	.012	.062	.065	425
.078	.086	.083	.075	.014	.018	.078	.081	650
.094	.103	.099	.091	.018	.022	.094	.097	1,000
.125	.135	.131	.122	.024	.028	.125	.129	2,100
.156	.167	.162	.151	.028	.032	.156	.160	3,000
.187	.199	.194	.182	.036	.042	.187	.192	4,400
.219	.232	.226	.214	.042	.050	.219	.224	5,700
.250	.264	.258	.245	.042	.050	.250	.256	7,700
.312	.328	.321	.306	.060	.062	.312	.318	11,500
.375	.392	.385	.368	.060	.077	.375	.382	17,600
.500	.521	.513	.485	.060	.094	.500	.510	25,800

MATERIALS Carbon steel and corrosion resistant steel.

SIZES Standard pins are available in sizes from .062 x 3/16" to .500 x 5".

FINISH Plain finish is standard. Pins are also available cadmium or zinc plated, or phosphate coated.

HARDNESS Carbon steel pins—Rockwell "C" 46-53 or equivalent; corrosion resistant steel pins—Rockwell "C" 43-52 or equivalent.

LENGTH TOLERANCES

0.250 to 1.000	± .015
1.001 to 2.000	± .020
2.001 to 3.000	± .025
3.001 to 4.000	± .030

STRENGTH The minimum shear strengths of standard carbon steel pins are listed above. All spring pins are heat treated to produce this shear strength as well as the spring characteristics.

PRICES Ordering information and prices upon request.

Planning for tomorrow • Producing for today!

For a third of a century Bendix Products Division has demonstrated time after time its ability to not only meet current production demands, but to actually anticipate future automotive requirements.

For example, Bendix* Power Braking and Power Steering are today two of the industry's most popular new car features because Bendix started planning them years ago.

Likewise, new products now being developed at Bendix Products Division may well be expected to make automotive headlines on future new car models.

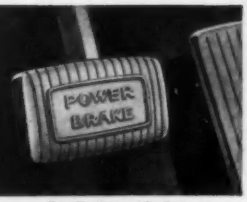
That this Bendix program of constant progress will continue is a certainty because looking ahead plays such a very important part of the job at Bendix.

*REG. U. S. PAT. OFF.

BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

TYPICAL EXAMPLES



Bendix Power Brakes

Bendix Power Steering

Bendix Products Division

Bendix AVIATION CORPORATION

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

It's An Inside Job

AUTOMOTIVE INDUSTRIES

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High Spots of This Issue

★ **American Motors' V-8 Engine Plant**

Estimated production requirements have been given careful consideration in the layout of equipment at the AMC engine plant in Kenosha, Wis. This study covers a sampling of operations on a group of major components of the V-8 power plant. Page 48.

★ **SAE National Aeronautic Meeting**

A comprehensive program of discussions revolving around timely questions of the Air Age was featured at the SAE Aeronautic Meeting last month. Additional attractions for those in attendance were a Production Forum and Engineering Display. Page 52.

★ **World's First Automobile With Free Piston Engine**

Although the principle of this type of power plant has been known for over 30 years, the new General Motors XP-500 car is said to represent the first application of a free piston engine in an automobile. Its design features are fully described. Page 54.

★ **Painting Facilities in Chrysler Canadian Plant**

Outstanding from the viewpoints of both practicality and modernity are the painting facilities found in a new annex to the Chrysler of Canada assembly plant at Windsor, Ont. The author reviews the equipment and advanced techniques used. See Page 62.

★ **Metallurgy of Automatic Transmission Gears**

Due to the exacting requirements demanded of components used in such complex mechanisms as automatic transmissions, materials selected for them must be chosen with care. The writers analyze the basic characteristics needed and how they are met. Page 66.

★ **36 New Product Items And Other High Spots, Such As:**

Continental production techniques; efficient parts assembly; Clarklift truck transmissions; ACS meeting; drop forgings in automotive developments; and 1956 Mobilgas Economy Run.

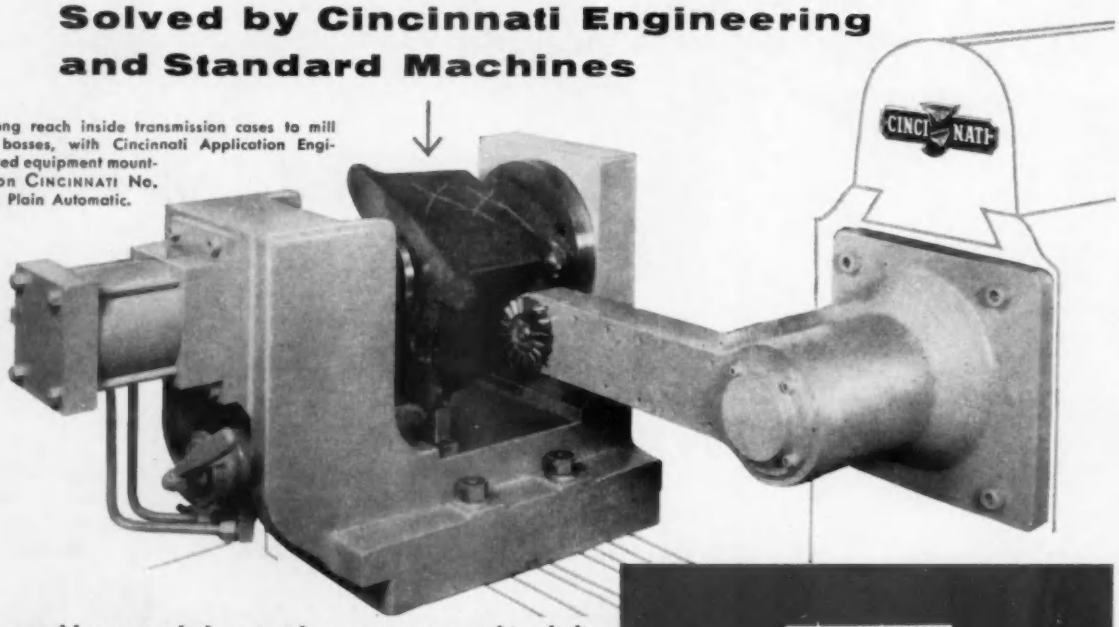
Complete Table of Contents, Page 3
Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

It's An Inside Job

Solved by Cincinnati Engineering and Standard Machines

A long reach inside transmission cases to mill the bosses, with Cincinnati Application Engineered equipment mounted on CINCINNATI No. 1-18 Plain Automatic.

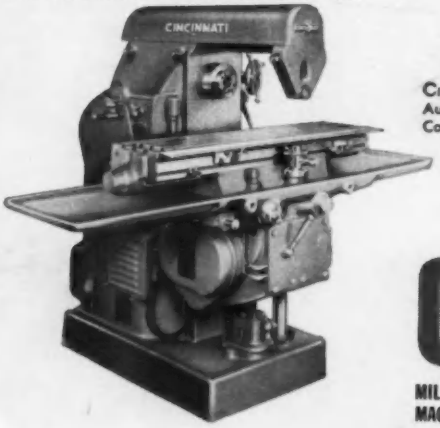


How would you reach deep inside a casting to machine bolt bosses? Cincinnati Application Engineers, long experienced in solving tricky machining operations, tooled up the inside job shown here with a long reach right-angle milling attachment mounted on a standard CINCINNATI® No. 1-18 Plain Automatic Miller. To reduce tiring physical effort, the work is held in an air operated fixture.

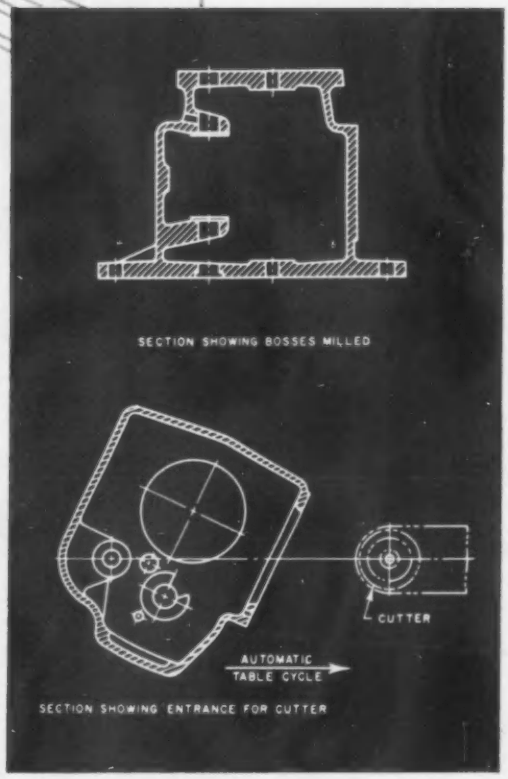
The 1-18's fast automatic table cycle, with a feed rate of 11 in. per min., keeps production going at a rate of about 100 transmission cases per hour.

Although this is a rather simple setup, it illustrates what Cincinnati Engineering Service and standard Cincinnati Milling Machines can do for you. ¶ Here's a good point to consider for your next milling machine requisition: standard Cincinnatis range from ½ hp drive to 50 hp drive, and hundreds of sizes in between. You might like to learn more about the production pacemaker shown here, the No. 1-18 Plain Automatic. Ask for catalog No. M-1555-3, or look in Sweet's for brief specifications.

THE CINCINNATI MILLING MACHINE CO. **CINCINNATI 9, OHIO**



CINCINNATI No. 1-18 Plain Automatic Milling Machine. Catalog No. M-1555-3.



CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 9 May 1, 1956

Chrysler's Expansion To Cost Upward of $150 Million in '56

Chrysler Corp.'s expenditures for improvement and expansion of plants this year will total between $150 and $160 million. The figure is about three times greater than the company invested two years ago and slightly more than last year.

The outlay does not represent new money, but is part of the corporation's long-range multi-million expansion program announced earlier. Biggest projects this year will be construction of a new stamping plant in Twinsburg, O., and conversion of the Delaware tank plant to automobile production.

Test Track To Be Built Near New Lincoln Plant

A quarter-mile oval test track will be built adjacent to Lincoln's new general office and manufacturing building. The latter is now under construction at Novi, Mich.

Work on the three-story 200,000 sq ft office building itself was started in February, while first steps in construction of the 1.3 million sq ft manufacturing plant got under way a few weeks ago with laying of the foundation. Located 28 miles northwest of Detroit, the new facility is scheduled to be completed in the spring of 1957.

Studebaker-Packard Weighs Possible Plans for Future

What course of action Studebaker-Packard Corp. is planning to follow regarding the future is uncertain at this stage. As widely reported in the public press, the company openly admits that it is having difficulty obtaining an estimated $100 million in long-term financing. Principal purposes for which the money apparently would be used are expansion of the dealer organization, increased advertising and promotion, and tooling for 1957 models.

Although a financial statement for the first quarter of this year is expected to show more red ink in the face of a 1955 loss of close to $30 million, the company continues to be reasonably optimistic. Efforts are being continued to obtain the needed capital and additional defense work.

Such was the situation as presented to stockholders at a meeting in Detroit last month. One suggestion made at the gathering was that for the formation of a stockholders protective committee. Headed by a Detroit attorney, it seeks to get together at least two per cent of the total six million outstanding S-P shares that would give it a powerful voice in corporate affairs.

Persistent rumors that S-P is planning to merge with another company were sidestepped by S-P officials. James J. Nance, S-P president said the company is studying a number of alternate plans, but he did not elaborate on any of them.

COMMERCIAL TRANSPORT WITH GE JET ENGINES

Convair is entering the commercial jet transport manufacturing field with the Skylark 600. The 80-passenger plane will be powered by four new GE CJ-805 jet engines and is intended for medium-range operations. The engine—a commercial version of the GE-J-79—will be built in volume at the Evendale, O., plant of General Electric.

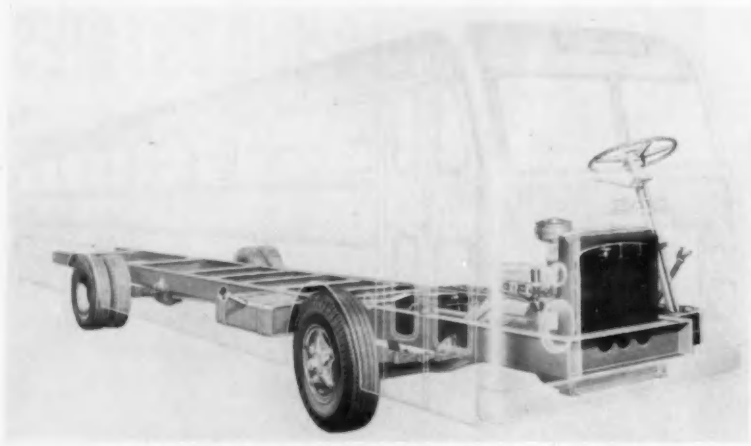
Cost For New Ford 'E' Car Estimated At $250 Million

While obviously most data about Ford's forthcoming new car remains a closely guarded secret, the company gradually is beginning to release some sketchy information concerning it. For example, it has been revealed that the car will have cost about $250 million to develop.

The car, designated as the Model E, is expected to appear late in 1957 as a 1958 model in a series priced between (about $3,000) the Mercury and Lincoln lines. Ford's highest-priced Mercury carries a suggested list price of about $2,600, while the lowest-priced Lincoln has a price tag in the neighborhood of $3,700.

Ford soon will start to build a dealer organization to market the new car. Investments by dealers in setting up sales and service outlets will run between $100 million and $150 million. The company reportedly has already selected a name for the new model, but it also remains secret at present.

News of the AUTOMOTIVE



SCHOOL BUS CHASSIS WITH ROLL-OUT ENGINE

This phantom drawing shows a new forward-control SM461V school bus chassis with roll-out engine developed by GMC Truck & Coach Div. of General Motors Corp. The 72-passenger vehicle is built on a 209-in. wheelbase and is powered by a 160-hp gasoline engine. Hydra-Matic transmission and one-shift axle are other chassis features

2.5 Millionth 'Rocket' Engine Built By Olds

Oldsmobile last month turned out its 2.5 millionth "Rocket" V-8 engine, a little more than 7½ years after the first one was put into production. The first Rocket power plant to be built by Olds developed 135 hp and had a compression ratio of 7.25 to 1. Its 1956 counterpart develops 240 hp and has a compression ratio of 9.25 to 1.

Ford Changes Price Structure To Conform with GM, Chrysler

Ford Motor Co. has been quietly revising freight and wholesale charges on its cars to more closely parallel those of General Motors and Chrysler. The company was the first of the Big Three to alter its pricing structure earlier this year. It has, however, been prompted to make several modifications since it found that it was basing its changes on a formula slightly different from one used by the other two companies.

The ultimate result is that the wholesale prices on Ford, Lincoln, and Mercury cars have been boosted for the second time to parallel General Motors and Chrysler prices more closely. However, the overall prices dealers in outlying areas have to pay for those cars have actually been reduced because freight charges were lowered again to bring them in line with those of GM and Chrysler.

Ford's original increase in wholesale prices earlier this year amounted to a minimum of $16, compared with $23 on Chevrolets and $22.75 on Plymouths. The additional increase in Ford wholesale prices—approximately $8—thus brings Ford's total wholesale price increase in the neighborhood of those made by GM and Chrysler. In some instances, the price of certain Ford models is slightly lower now since turn indicators have been made standard.

Dealers located in areas closer to the factory do not benefit from the lower freight charges and must absorb the wholesale price increase or pass it on to the consumer. All in all, however, the entire pricing revision program is designed to equalize actual car costs to dealers all over the country and eliminate "phantom freight."

At the same time, Dodge announced slight increases in wholesale prices and reductions in freight charges on trucks. The freight cutbacks range up to $45 per unit, while the wholesale increases run from a minimum of $23 to $35.

Ferguson Vehicle Details Remain Under Close Wraps

No further details of the Ferguson vehicle project (see AI, Dec. 15, 1955, p. 33) are expected to be disclosed officially for at least six months, according to a spokesman for Harry Ferguson Research, Ltd. Discussions with several British and foreign manufacturers are proceeding, but no technical details reportedly will be revealed until an agreement for production rights is concluded.

The organization has now formally denied the widespread reports of last winter that the Ferguson design was based on individual hydraulic turbines for all four wheels, driven from a common pump. It is currently believed that the vehicle chassis frame consists of a central tubular backbone housing a full-length propellor shaft linked through an automatic transmission to the rear-mounted engine.

Swinging half-axles, suspended on angled coil springs, are joined through universal joints to the front and rear differentials. An overrunning clutch in the propellor shaft between the two differentials compensates for the wider arc followed by the front wheels during a turn in either direction.

A single multi-disk brake, mounted on the extreme front end of the backbone and operating on the propellor shaft, applies retarding force simultaneously and equally to all four wheels. No wheel can lock or skid under braking as long as any of the others continue to turn. Adhesion to the road is further improved by the very low unsprung weight resulting from the absence of outboard brake drums.

Reynolds Official Forecasts More Aluminum in 1956 Cars

Next year's automobiles will use one-third again more aluminum than 1956 models, according to an official of Reynolds Metals Co. David P. Reynolds, vice-president in charge of sales, predicted that on the average each 1957 car produced will contain from 42 to 45 lb of the light metal, as compared to a 33-lb average for current models.

AND AVIATION INDUSTRIES

GE Unveils Ultra-Modern Plant For Output of Induction Motors

What is said to be the world's most modern factory for the manufacture of induction motors was unveiled recently by General Electric Co. in Schenectady, N. Y. Featuring highly mechanized production lines, the facility was built at a cost of approximately $7 million and is designed to meet a rapidly expanding total electric motor market, which is expected to be at least 75 per cent higher by 1965.

The new plant makes extensive use of push-button controls to machine, assemble, and test GE Tri-Clad 55 induction motors. Example of the highly mechanized setup is found in an array of automatically operated punch presses at the beginning of each of the production lines for standard motors (a third line is devoted to the output of special motors).

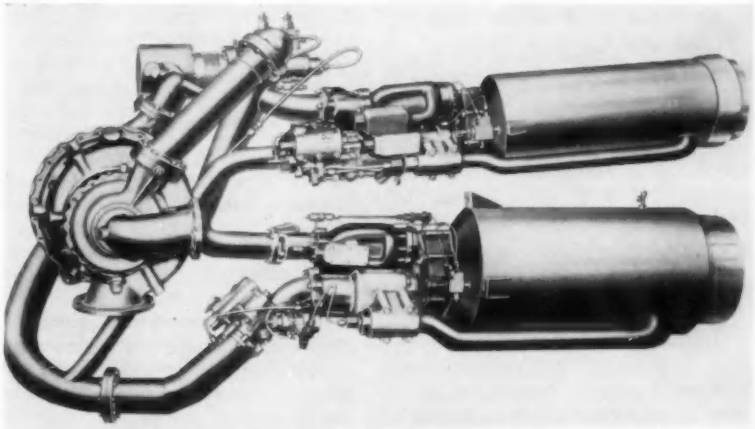
Punching operations are fully automatic, including the feeding of sheet steel into the presses, the punching, conveying of the punchings from one press to another by means of magnetized belts, and the automatic removal of metal scrap. Production time on standard induction motors has thus been cut from two weeks to three eight-hour shifts.

Ford Aide Predicts $16 Billion In Car Sales In Next 10 Years

Some indications of what lies ahead for the automobile industry is given by Stahrl Edmunds, manager of the Dept. of Economic Studies of Ford Motor Co. Although sales of automobiles this year are expected to decline by about $1 billion under last year's $12 billion, Mr. Edmunds predicts the industry will be selling in the neighborhood of $16 billion worth of cars by 1965, about 40 per cent more than at present.

Thus, with disposable income expected to rise by 40 per cent in the next 10 years, it would seem that present predictions by some observers for automobile production are somewhat conservative. Some estimate that automobile output in the next 10 years will average between eight and nine million. The foregoing estimate is certainly not unusual in the light of what happened last year alone, when close to eight million cars were built.

Spurred by new developments anticipated in the next 10 years, the automobile scrappage rate alone is expected to increase to about five million a year or higher. A sharp rise in the country's population, which some economists estimate will soar to in the neighborhood of 193 million by 1965, a continued increase in multiple-car families, and long-range expansion plans by industry further bolster optimism.



THROTTLEABLE ROCKET ENGINE FOR BELL AIRPLANE

This powerful rocket engine, designed and built by the Propeller Div. of Curtiss-Wright Corp., is said to be the first rocket which can be throttled up and down by the pilot. It is used to propel the Bell X-2 supersonic experimental plane for probing the thermal barrier and has power comparable to that of a Navy cruiser.

F. L. Jacobs Schedules Modernization Program

In the midst of announcements that several automobile parts suppliers are getting ready to discontinue their automotive operations for lack of business comes an encouraging report from F. L. Jacobs Co. of Detroit. While at least two Detroit companies are withdrawing from the business, Jacobs is planning to expand.

Part of the program calls for expansion of its Detroit subsidiary—Continental Die Casting Corp.—and installation of new automatic plating lines.

White Sales, Earnings Rose To Peak In 1955

Sales of White Motor Co. climbed to a record $179.9 million last year, 24 per cent ahead of 1954. The present backlog of orders indicates sales this year may top that figure. Net income also was at a record in surpassing $6 million.

The company last year delivered 16,880 new vehicles, compared with 12,951 in the previous year. White continues to broaden its diversification program in placing particular emphasis on expanding the applications of its Diesel engines in the construction equipment and other industrial fields. Addition of a new series of Superior engines recently (March) marks another step in the company's efforts to solidify itself.

Erratum

It was erroneously stated on page 85 of the March 15, 1956 issue of AUTOMOTIVE INDUSTRIES that three new British Ford models have hollow crankshafts cast of nodular iron. Word has since been received from Ford Motor Co. that these crankshafts are made of a material generally characterized as *cast steel*, rather than nodular iron.

News of the AUTOMOTIVE

Continental Aviation Wins Contract For Gas Turbines

Continental Aviation and Engineering Corp. has received another contract for gas turbine engines for aircraft. Valued at $9.3 million, the latest Air Force award covers production of J-69-T9 power plants for Cessna T37 twin jet trainers.

First Quarter Fruehauf Sales Rise 50 Per Cent Above 1955

Despite a slow start in January, sales by Fruehauf Trailer Co. for the first three months climbed by more than 50 per cent above last year's $47.9 million. The company is shooting for a sales goal of $400 million this year and $500 million in 1957.

Since the beginning of the year the company has added four new plants to its operations and is constructing additional ones in the West and Southwest. Fruehauf now builds approximately 50 per cent of the truck trailers manufactured. There are about 150 other companies in the business.

Supporting the company's confidence that sales will reach a new high this year are predictions that the 700,000 boxcars now in use by the railroads eventually will be replaced by some 1.4 million truck trailers on flatcars. About $4 million of the company's present backlog is for railroad "piggyback" equipment.

1956 U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

	For Weeks Ending				Jan. 1 through
	April 14	April 7	March 31	March 24	April 14, 1956
PASSENGER CAR PRODUCTION					
Hudson	560	476	355	826	14,005
Nash	1,256	1,238	1,225	2,525	31,715
Total—American Motors	1,816	1,714	1,580	3,351	45,720
Chrysler and Imperial	2,664	2,199	2,516	2,589	40,687
De Soto	2,360	2,278	2,217	2,394	37,376
Dodge	4,050	3,889	3,682	3,890	62,736
Plymouth	11,216	9,444	9,308	9,549	151,351
Total—Chrysler Corp.	20,290	17,810	17,923	18,422	292,150
Continental	30	28	27	30	825
Ford	30,139	29,319	28,854	27,315	421,915
Lincoln	1,412	1,300	888	774	16,808
Mercury	7,350	6,647	5,170	4,127	77,845
Total—Ford Motor Co.	38,931	37,294	34,939	32,246	517,393
Buick	13,292	14,075	11,719	14,362	218,759
Cadillac	3,370	3,367	3,327	3,383	49,972
Chevrolet	38,376	38,356	37,786	36,400	545,161
Oldsmobile	9,869	10,757	8,429	11,583	170,158
Pontiac	7,603	8,167	7,176	8,797	130,176
Total—General Motors Corp.	72,510	74,722	68,437	74,525	1,114,226
Packard	746	12	931	850	8,055
Studebaker	1,541	1,331	1,808	1,922	34,454
Total—Studebaker-Packard Corp.	2,287	1,343	2,739	2,772	42,509
Checker Cab	120	104	69	97	842
Total—Passenger Cars	135,954	132,987	125,687	131,413	2,012,640
TRUCK PRODUCTION					
Available	13	8	19	10	113
Chevrolet	8,063	7,998	7,504	7,729	122,652
G. M. C.	2,039	1,992	2,247	2,464	31,551
Diamond T	97	101	102	104	1,453
Divco	80	80	73	80	1,320
Dodge and Fargo	1,805	1,837	1,858	1,942	25,878
Ford	6,496	6,638	6,766	6,092	96,271
Four Wheel Drive	15	17	16	37	631
International	3,028	3,044	3,171	2,915	44,760
Mack	336	324	389	315	5,491
Marmon-Herrington	9	12	15	36	163
Reo	78	71	74	75	1,087
Studebaker	474	454	282	307	4,531
White	367	359	370	379	5,826
Willys	1,296	1,363	1,172	1,209	19,344
Other Trucks	107	118	108	104	1,587
Total—Trucks	24,306	24,417	24,168	23,798	382,658
Buses	69	80	87	105	1,203
Total—Motor Vehicles	160,329	157,484	149,942	155,316	2,376,501

GM Profits Off 8.5 Per Cent During First Three Months

Despite lower automobile production, General Motors earnings in the first three months declined by about only $26 million under the record three-month period last year, or about 8.5 per cent. The company reported a net of $283 million on total sales of $3.06 billion. Sales came close to last year's record of $3.1 billion.

GM's defense business accounted for four per cent of total volume, compared with nine per cent in the first quarter last year. Unit sales of cars and trucks in the period totaled 1,094,000, slightly under last year's 1,147,094.

Ford Gives More Details About New Glass Facility

Further details about Ford's new glass manufacturing plant, now being constructed near Nashville, Tenn., show it will be one of the most completely automated units of its type in the industry. It will contain two melting furnaces which will yield nearly 400 tons of glass a day. The glass will be ground and polished on a line nearly 2000 ft long.

The one million sq ft unit, scheduled for completion in 1957, will have eight silos for storing raw materials. There will be an adjacent powerhouse and water cooling tower. The company expects to spend about $27 million a year for materials, utilities and payrolls at the new plant.

Vinco To Discontinue Automotive Operation

While automobile companies generally guide parts suppliers in keeping manufacturing costs at a minimum, several concerns have claimed that their total automotive volume is insufficient to continue operations. Last month, Vinco Corp., Detroit parts maker, announced it would suspend automotive operations shortly for that reason.

Vinco was the second Detroit parts company to make the decision within one week. Motor Products Corp. earlier said it was ending its automotive work later this year.

AND AVIATION INDUSTRIES

RAZOR-WINGED JET FIGHTER PLANE

Lockheed F-104A Starfighter represents a powerful combination of speed and flying performance. Powered by a GE J-79 turbojet engine, it has been heralded as the world's fastest fighter, although top speed remains secret. Unusually thin wings are so sharp that sheaths are fitted onto wing edges to protect ground crewmen.

New Elastomers Laboratory Is Opened by Du Pont Co.

Marking its 34th year of activity in the field of rubber, Du Pont Co. officially opened its new product development and technical service Elastomers Laboratory at Wilmington, Del., on April 19.

The $2.8 million, 70,000 sq ft installation was made necessary by the company's expanding business in synthetic rubbers and rubber chemicals. It will enable Du Pont's Elastomers Div. to broaden its sales-service work.

The new Elastomers Laboratory is designed primarily to provide technical service on neoprene, "Hypalon" synthetic rubber, "Hylene" organic isocyanates, and rubber chemicals. It can duplicate on a pilot-plant scale many operations in rubber manufacture.

Separate laboratory areas are provided for isocyanate work, adhesives, paper, dry-polymer processing, latex, physical testing, and consumer-product testing. Processing and testing facilities are of the latest type for both liquid and dry rubbers.

AI TABLOID

Fageol Products has purchased Progressive Engine Products Co.

* * *

General Electric Co. has announced a $6.8 million expansion of its gas turbine facilities at Schenectady, N. Y.

* * *

Lake Auto Radiator Mfg. Co. has moved its Cleveland facilities to new and larger quarters at 5200 W. 130th St., Cleveland, O.

* * *

Link-Belt Co. has announced a $3.5 million expansion program for a new foundry and manufacturing facilities at its Ewart Plant in Indianapolis, Ind. . . . Hyster Co. will erect a $150,000 factory addition in Peoria, Ill.

* * *

Neotronic Corp. is now offering a new method of chromium plating any base metal or alloy. A combination of micro-waves with direct current is used.

* * *

Sun Electric Corp. has launched construction on a new $1 million engineering research development center at Wheeling, Ill.

* * *

Doehler-Jarvis Div. of National Lead Co. has begun design work on a V-8 automobile engine block to be die cast in aluminum.

* * *

American Chemical Paint Co. has acquired office and plant facilities at St. Joseph, Mo., and expects to be operating there about June.

* * *

B. F. Goodrich Co. plans to spend $200 million for expansion during the five-year period of 1955-60.

* * *

Aluminum Co. of America is beginning work on a new 150,000 ton smelting plant near Evansville, Ind.

Michigan Tool Co. has formed a new Gear-O-Mation Div. It will design and build automation equipment for manufacture of gears and other comparable small parts.

* * *

Industrialist Howard Hughes plans to build an aircraft manufacturing plant in Florida at a site to be yet determined.

* * *

Air Force is building a $420,000 guided missile engine test facility at the Hawthorne, Calif., plant of Northrop Aircraft, Inc.

* * *

Directors of Borg-Warner Corp. and York Corp. have approved the affiliation of the two companies. Under the plan, subject to approval by stockholders of the latter, Borg-Warner would acquire all York assets and liabilities.

* * *

Firestone Tire & Rubber Co. has disclosed plans for construction of a $4 million tire manufacturing plant at Havana, Cuba.

* * *

Gabriel Co. has acquired the direct action hydraulic shock absorber business and inventory of Houdaille Industries, Inc. It has also taken over the automotive heater business of E. A. Laboratories, Inc.

* * *

Aluminum Co. of America has officially named its research branch Alcoa Research Laboratories.

* * *

Convair Div. of General Dynamics Corp. has been awarded an Air Force contract to develop an airframe for a nuclear-powered plane. . . . Lockheed Aircraft Corp. will build and operate a large test facility for nuclear planes for the Air Force near Dawsonville, Ga.

(Turn to page 134, please)

News of the AUTOMOTIVE

INDEPENDENTS DISPLAY MODERATE GAINS OVER 1955

1956 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1956 Two Months' Totals

MAKE	February 1956	January 1956	February 1955	TWO MONTHS Units 1956	Units 1955	Per Cent of Total 1956	Per Cent of Total 1955
Chevrolet	114,667	109,342	98,377	224,009	176,064	25.47	19.21
Ford	93,899	85,775	107,849	179,674	197,572	20.44	21.56
Buick	45,552	44,803	51,634	90,355	102,216	10.28	11.16
Plymouth	38,341	36,945	46,531	75,286	93,882	8.56	10.25
Oldsmobile	35,858	36,525	40,379	72,413	80,250	8.24	8.76
Pontiac	28,600	28,721	35,408	57,321	71,990	6.52	7.86
Mercury	20,138	19,700	23,223	39,838	44,456	4.53	4.85
Dodge	16,107	15,501	19,809	31,608	40,452	3.60	4.41
Cadillac	10,308	11,472	10,931	21,780	23,450	2.48	2.56
Chrysler	8,873	9,096	11,398	17,971	24,736	2.04	2.70
De Soto	7,804	7,496	8,382	15,100	17,347	1.72	1.89
Studebaker	7,400	7,000	7,308	14,400	13,948	1.64	1.52
Nash	6,115	5,527	4,325	11,642	8,970	1.32	.98
Lincoln	3,189	2,942	1,995	6,111	4,172	.70	.46
Packard	2,733	2,833	3,100	5,566	4,789	.63	.52
Hudson	2,648	2,583	2,451	5,231	4,945	.59	.54
Continental	165	210		375		.04	
Misc. Domestic	124	104	931	228	1,934	.03	.21
Foreign	5,211	5,073	2,553	10,284	5,105	1.17	.56
Total—All Makes	447,542	431,648	476,584	879,190	916,278	100.00	100.00

* Based on data from R. L. Polk & Co.

ASME Gas Turbine Conference Reviews Latest Developments

The first annual conference and exhibit of the Gas Turbine Power Div. of the American Society of Mechanical Engineers met with an enthusiastic reception by those in attendance. Held in Washington the middle of last month, the program included six technical sessions on the latest gas turbine developments and some 25 exhibits by concerns active in the field.

Opening sessions at the conference included discussions on problems of combustion and engine life. Succeeding ones were devoted to a review of developments in turboprop and turbojet aircraft engines. Papers at other technical sessions were devoted to such subjects as: rotary regenerators for gas turbines; design considerations for Naval gas turbines; development of sleeve bearings for high-speed gas turbines; and closed-cycle gas turbines.

Principal attraction in the Allison exhibition booth was a cutaway view of its Model 501 turboprop engine. Boeing and Fairchild also presented cutaways of their Model 502 and J-44 engines, respectively.

Lycoming held its first public showing of the new XT-53 gas turbine engine for the Bell XH-40 Bell helicopter, and Solar Aircraft Co. displayed its small Mars and Jupiter gas turbines. Fabricast Div. of General Motors Corp. showed its blades and vanes for turbines, while New Departure Div. exhibited typical split inner ring type bearings and accessory group bearings.

Scintilla Div. of Bendix Aviation Corp. presented its latest ignition systems for gas turbine engines, and International Nickel Co. exhibited pieces of nickel and nickel alloys. Of the remaining exhibits, one of the most graphic was that in the booth of General Electric Co. A three-dimensional display portrayed the story of GE's one million plus hours of experience in the five major areas of application for its gas turbines.

Special feature of the event was a visit to the U. S. Naval Gun Factory. On exhibition there was an impressive display of the military applications of gas turbines. The variety of gas-turbine-powered equipment shown included: aircraft engine starting and portable power units; helicopter; mobile power generator; air compressor; fire pumps; mine sweeping craft and utility boats; and thrust augmentor.

1956 RETAIL CAR SALES BY PRICE GROUPS*

Number of Cars

Price Group	February 1956 Units†	February 1956 % of Total	February 1955 Units†	February 1955 % of Total	Two Months 1956 Units†	Two Months 1956 % of Total	Two Months 1955 Units†	Two Months 1955 % of Total
Under $2,000	83,002	18.77	259,080	54.66	158,407	18.24	479,757	52.65
$2,001 to $2,500	245,883	55.60	145,286	30.66	481,349	55.40	287,908	31.59
$2,501 to $3,500	95,188	21.53	55,428	11.70	191,175	22.01	113,486	12.45
Over $3,500	18,137	4.10	14,123	2.98	37,751	4.35	30,136	3.31
Total	442,210	100.00	473,917	100.00	868,682	100.00	911,287	100.00

Dollar Volume of Sales

Price Group	February 1956 Dollars	February 1956 % of Total	February 1955 Dollars	February 1955 % of Total	Two Months 1956 Dollars	Two Months 1956 % of Total	Two Months 1955 Dollars	Two Months 1955 % of Total
Under $2,000	$160,690,149	15.62	$492,455,908	47.06	$306,631,634	15.12	$912,192,304	44.93
$2,001 to $2,500	527,586,842	51.29	338,982,944	32.38	1,031,824,102	50.87	671,488,743	33.08
$2,501 to $3,500	264,711,071	25.74	157,438,480	15.04	532,314,533	26.25	322,908,788	15.91
Over $3,500	75,611,080	7.35	57,927,454	5.52	157,325,272	7.76	123,404,519	6.08
Total	$1,028,601,142	100.00	$1,046,684,686	100.00	$2,028,095,541	100.00	$2,029,994,354	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Ford Schedules Expansion At Chicago Assembly Plant

Ford is planning to expand its Chicago plant for assembly of station wagons and four-door models, now built at other plants. The company will add 300,000 sq ft of space to existing facilities. The plant will thus be able to go on a two-shift operation and increase daily output from nearly 490 vehicles a day to more than 700.

AND AVIATION INDUSTRIES

Buick Confident It Will Hold 10% Of Market Again This Year

Buick estimates it will build in the neighborhood of 675,000 cars this year. It bases its figures on forecasts that the industry as a whole will turn out 6.5 million automobiles in 1956.

If the division achieves that production goal, it would represent slightly above 10 per cent of the industry's total output, or about the same as Buick's penetration last year. Last year, the division turned out 781,000 cars, and output in the first quarter of this year totaled 191,000 units.

Fruehauf Introduces Line Of 12 New Truck-Trailers

A dozen new truck trailers, representing an investment of several million dollars in research, development, and tooling costs, were introduced by Fruehauf Trailer Co. recently in Detroit. Ranging in list prices from $5,000 to $25,000 each, they feature the use of lightweight materials and special engineering designs for greater inside trailer space and subsequently increased cargo capacity.

J. I. Case Shuts Down Farm Equipment Plant

Since its sales are down nearly 15 per cent, J. I. Case Co. has decided to close one of its plants in Racine, Wis. The move further reflects the downward trend in farm equipment sales this year.

Hay baler operations of the farm equipment plant will be moved to the company's tractor works in Racine; only the drop-forge shop will continue to operate. Plans to merge the company with Minneapolis-Moline Co., which also produces farm machinery, have been dropped for the time being.

Co-Operative Education Heralds Half Century at Univ. of Cinn.

The University of Cincinnati was the scene last month for a week-long exhibition and conference presented on the occasion of the 50th Anniversary of Co-operative Education. Included in the comprehensive program, planned by the Sponsoring Committee under the chairmanship of Frederick B. Geir, president of Cincinnati Milling Machine Co., were many varied attractions.

The dramatic story of America's industrial and scientific progress during the past half century was portrayed by the educational exhibits of some 75 companies. General Motors presented a stage review of progress made through science and research.

HUDSON HORNET SPECIAL V-8 HARDTOP MODEL

Pictured here is the two-door super Hollywood hardtop in the new Hudson Hornet special V-8 series (see AI, March 15, p. 74). Powered by an AMC 190-hp, V-8 engine, it is built on a 114¼ in. wheelbase. A four-door super sedan also is available in the new series. Factory list prices on the models are: four-door super sedan, $2405; two-door super Hollywood hardtop, $2512. Optional equipment is at extra cost.

S-P Subsidiary Constructing New Research Center In Calif.

Aerophysics Development Corp. has broken ground for a $1.3 million engineering and research facility in Santa Barbara, Calif. The concern, a wholly-owned subsidiary of Studebaker-Packard, has been engaged in research and development work for the Army, Air Force, and the Atomic Energy Commission.

(*Turn to page* 133, *please*)

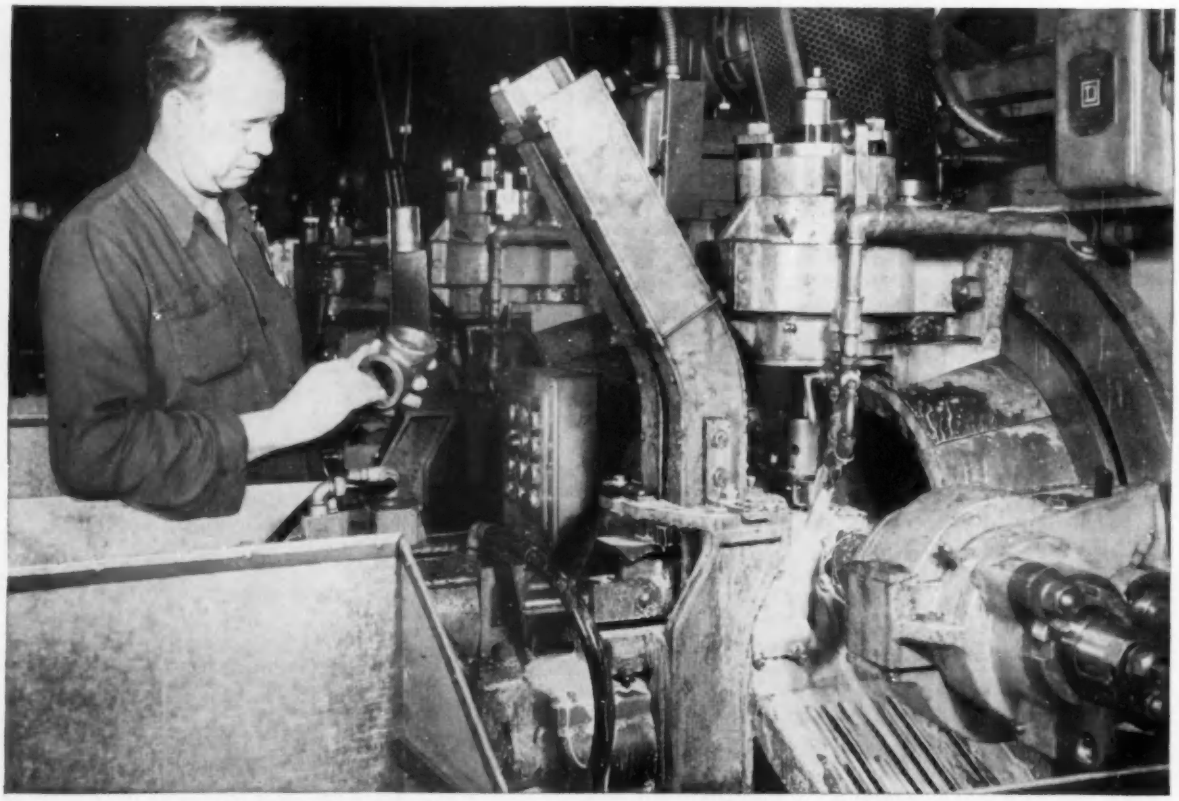
TRUCK SALES CONTINUE IN STRONG UPWARD SPIRAL

1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Two Months' Totals

MAKE	February 1956	January 1956	February 1955	TWO MONTHS Units 1956	Units 1955	Per Cent of Total 1956	Per Cent of Total 1955
Chevrolet	22,133	22,286	16,496	44,419	35,924	33.74	30 33
Ford	18,791	19,044	19,401	37,835	38,175	28 75	32.23
International	7,842	8,108	6,857	15,950	15,251	12.12	12.88
G.M.C.	6,970	6,872	3,856	13,842	9,014	10.52	7.61
Dodge	3,863	4,140	4,682	8,003	9,963	6.08	8.41
White	1,300	1,251	919	2,551	1,942	1.94	1.64
Mack	897	959	530	1,856	1,071	1.41	.90
Willys Truck	949	861	1,222	1,810	2,419	1.38	2.04
Studebaker	845	849	772	1,694	1,522	1.29	1.29
Willys Jeep	656	450	657	1,106	1,299	.84	1.10
Diamond T	289	318	236	607	457	.46	.39
Divco	262	203	186	465	433	.35	.37
Reo	191	218	125	409	336	.31	.29
Kenworth	66	108	56	174	147	.13	.12
Brockway	56	75	86	131	183	.10	.15
F.W.D.	31	41	16	72	35	.05	.03
Peterbilt	22	38	17	60	40	.05	.03
Misc. Domestic	60	95	57	155	103	.12	.09
Foreign	255	225	71	480	119	.36	.10
Total—All Makes	65,478	66,141	56,242	131,619	118,435	100.00	100.00

* Based on data from R. L. Polk & Co.



Detroit Brass & Malleable Co. is one of the largest manufacturers of plumbing and drainage fittings in the Midwest. Over 3 million fittings are turned out each month on these automatic tappers. A 10:1 emulsion of *Texaco Soluble Oil C* is used exclusively as the cutting fluid.

"We proved it pays to use Texaco"— says Mr. Robert Welch, General Foreman, Detroit Brass & Malleable Co., Wyandotte, Michigan

THIS PLANT had been using *Texaco Soluble Oil C* in its automatic tapping machines for 15 years. Results were excellent. But how about economy?

To answer this important question, Texaco was tested against 14 other brands. On the basis of test runs, machines were changed over to a less expensive oil that *seemed* equal in quality to Texaco.

"After 30 days with the new oil," reports Mr. Welch, "tool life was shorter than it had been with Texaco, and rusting was a serious problem. We went right back to Texaco, and are again getting longer tool life, better finish without a trace of rust, and more profitable production."

This typical experience points out one important fact: whatever the stock, however you machine it—there is a complete line of Texaco Cutting, Grinding and Soluble Oils to help you get the job done better, faster and at lower cost.

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Men in the News

Black & Decker Mfg. Co.—Robert D. Black was elected president and chairman of the board.

Eaton Manufacturing Co. — **Clarence I. Ochs** has retired as chairman of the board, although he continues as chairman of the executive committee and a director. **Howard J. McGinn** succeeds him, while remaining president also.

Ford Motor Co., Car and Truck Divs.—**Max L. Wiesmyer** has been appointed assembly operations consultant.

Towmotor Corp.—**Robert L. Fairbank** has been made vice-president, and **David A. Quere** has been chosen assistant controller.

Chrysler Corp. — **Howard J. Connelly** has been named director of traffic.

American Chain Div., American Chain & Cable Co., Inc.—**W. D. Kirkpatrick** has retired as vice-president and sales manager; **William B. Ilko** succeeds him as sales manager.

White Motor Co.—**J. P. Dragin** and **Henry J. Pipp** have been elected vice-president for finance and controller, respectively.

Goodyear Tire & Rubber Co.—**E. J. Thomas** has become chief executive officer as well as president. He succeeds **P. W. Litchfield,** who continues as chairman of the board. The following have been named executive vice-presidents: **R. S. Wilson,** sales; **P. E. H. Leroy,** finance and accounting; and **R. DeYoung,** production, personnel, research, and development. **Victor Holt, L. E. Spencer,** and **F. J. Carter** have been made vice-presidents.

Lincoln Div., Ford Motor Co.—**Frederic E. Langlotz** was named administrative sales planning manager, and **James L. Craw** was made manager of the industrial relations office.

Buick Motor Div., General Motors Corp.—**Rowland H. Archer** has been appointed superintendent of the sheet metal stamping plant.

Hudson Motors Div., American Motors Corp.—G. R. Browder and J. W. Watson have been named assistant sales managers.

Houdaille Industries, Inc. — **Ralph F. Peo** has been elected chairman of the board, and **Waldo L. Werner** was made comptroller.

Westinghouse Electric Corp., Transformer Div.—**John H. Chiles** is now division manager; **M. E. Fagan, Jr.,** engineering manager; and **Charles H. Chance,** industrial relations manager.

Thompson Products, Inc.—G. R. Moore has been elected a vice-president.

Lamb Electric Co.—**Howard F. Doll** has been appointed vice-president and plant manager, and **Francis H. Gerlach** has been named vice-president and engineering manager. **Walter H. Poesse** and **Milton H. Spielman,** two of the founders of the original company, have resigned as vice-presidents but will continue as consultants.

Black & Decker Mfg. Co.—**Alonzo G. Decker, Jr.,** was elected executive vice-president.

Ford Div., Ford Motor Co.—**M. S. McLaughlin** is now executive assistant to the general sales manager.

General Motors Corp.—**George A. Jacoby** has been appointed director of personnel relations.

Hudson Motors Div., American Motors Corp.—**George L. Staudt** has been appointed director of advertising and merchandising.

Century Electric Co.—**Frank E. Nutt** is now sales promotion manager.

Ford Div., Ford Motor Co.—Ward A. Folsom has been appointed general manufacturing manager.

Marion Power Shovel Co.—**Milton T. Smith** has been elected president and general manager.

Buick-Oldsmobile-Pontiac Assembly Div., General Motors Corp.—**Marshall H. Boden** has been named manager of the new Sunnyvale, Calif., plant.

Ford Div., Ford Motor Co.—**Chase Morsey, Jr.,** has become car marketing manager; **J. S. Snyder,** truck marketing manager; and **H. D. Hubbs,** parts and service operations manager.

(*Turn to Page* 144, *please*)

Necrology

William H. Bolte, 63, manager of General Motors' B-O-P Assembly Div. plant at Atlanta, Ga., died there on April 5.

John E. Andress, 79, retired board chairman of Barnes Drill Co., died recently, at Rockford, Ill.

Russell C. Mahon, 66, founder and chairman of the board of R. C. Mahon Co., died March 30, at Detroit, Mich.

Charles D. McWilliams, 58, general foreman of the Motor Transport Div. of American Motors Corp., died recently, at Kenosha, Wis.

Herbert A. Faber, 72, chairman of the board of Formica Co., died March 31 at Cincinnati, O.

D. A. Drott, 69, founder and board chairman of Drott Tractor Co., died April 5 at Raleigh, N. C.

Maurice Collette, 70, a former vice-president of BBD&O advertising agency, died April 3, at Bronxville, New York.

Herbert H. Franklin, 89, builder of the old Franklin car, died April 16, at Syracuse, N. Y.

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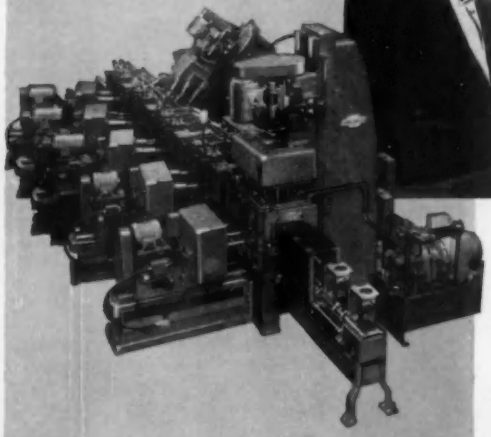
Greenlee Six-Spindle Automatic Bar Machine.

Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.



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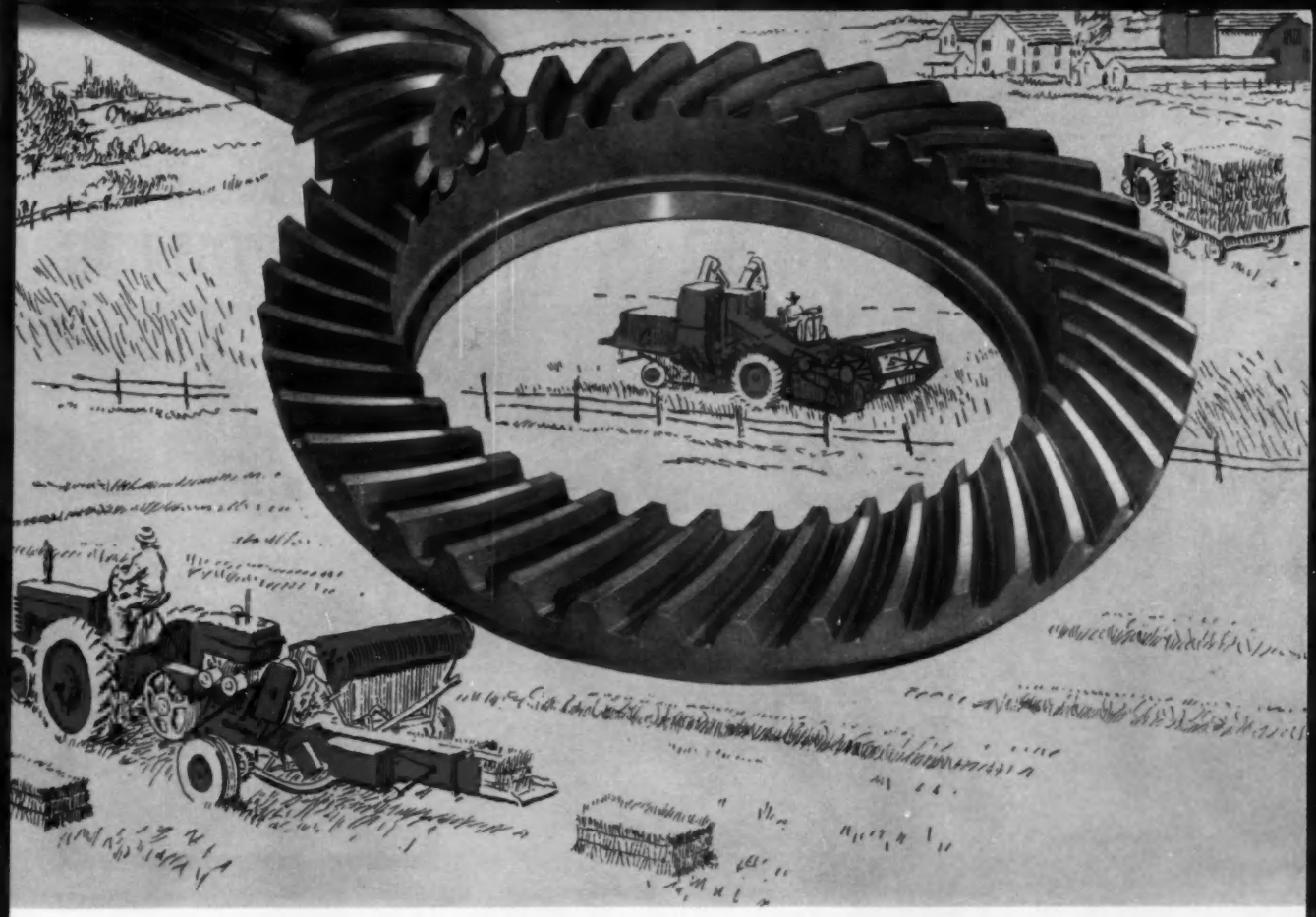

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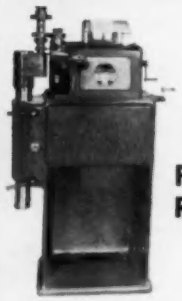

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All gears are steel, machine cut and heat treated for hardness and sealed in oil. The Universal Joint is a heavy duty Blood Bros. product. The frame is electrically welded and covered with 12-gauge steel. The machine is equipped with Shear Pin to lessen breakage under undue stress. The cutter is sold with or without tires. 15 or 16-inch wheels are optional. Parts are always available.
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...so in advertising and literature, these machinery builders feature

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These farm machinery manufacturers, too, have learned from past satisfaction that customers *respect and prefer to buy* implements with Blood Brothers Universal Joints.

So in catalogs and advertising, they *voluntarily* feature the dependable, uniform high quality of Blood Brothers Drive Lines.

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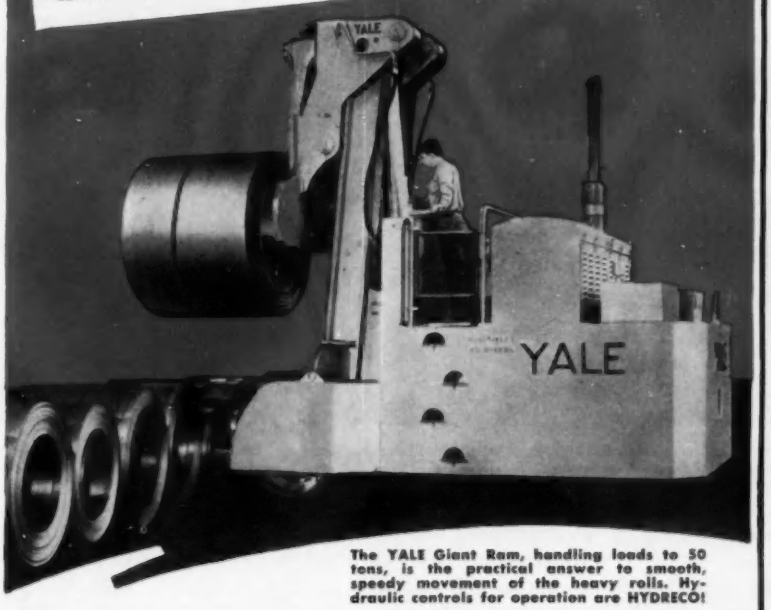

The YALE Giant Ram, handling loads to 50 tons, is the practical answer to smooth, speedy movement of the heavy rolls. Hydraulic controls for operation are HYDRECO!

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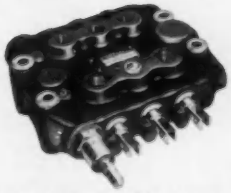
Power for the Hoist Cylinder and adjustable forks of the YALE Giant Ram is furnished by a 3000 Series HYDRECO Pump.



Series V-12 HYDRECO Valve controls the Hoist Cylinder. An auxiliary HYDRECO Valve controls the forks.

The equipment that is "getting things done" today is more often than not equipped with HYDRECO Hydraulic Pumps, Motors, Valves and Cylinders. And, in engineering tomorrow's successful Materials Handling equipment, Farm Machinery, Heavy Construction and Earth Moving vehicles, the one outstanding attribute you will look for in components for the hydraulic system is —DEPENDABILITY. For years, the builders of equipment that "sells and performs" have used HYDRECO Oil Power. And, they have also drawn freely from the well of engineering "know-how" and experience which is here in HYDRECO. All are here for you, too.

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Loading end of 25-station Natco Holeway transfer machine for handling a variety of drilling, reaming, and tapping operations on both ends of the V-8 cylinder block.

American Motors' V-8 Engine Plant

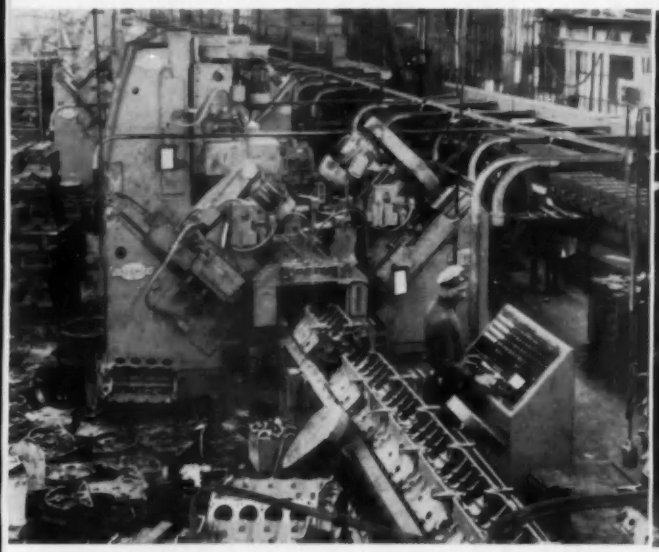
By
Joseph Geschelin

PART I

THE swing to high performance V-8 engines continues without abatement. The latest entry, the distinctive V-8 being produced by American Motors Corp. in Kenosha, was described in detail in AI, March 15, 1956.

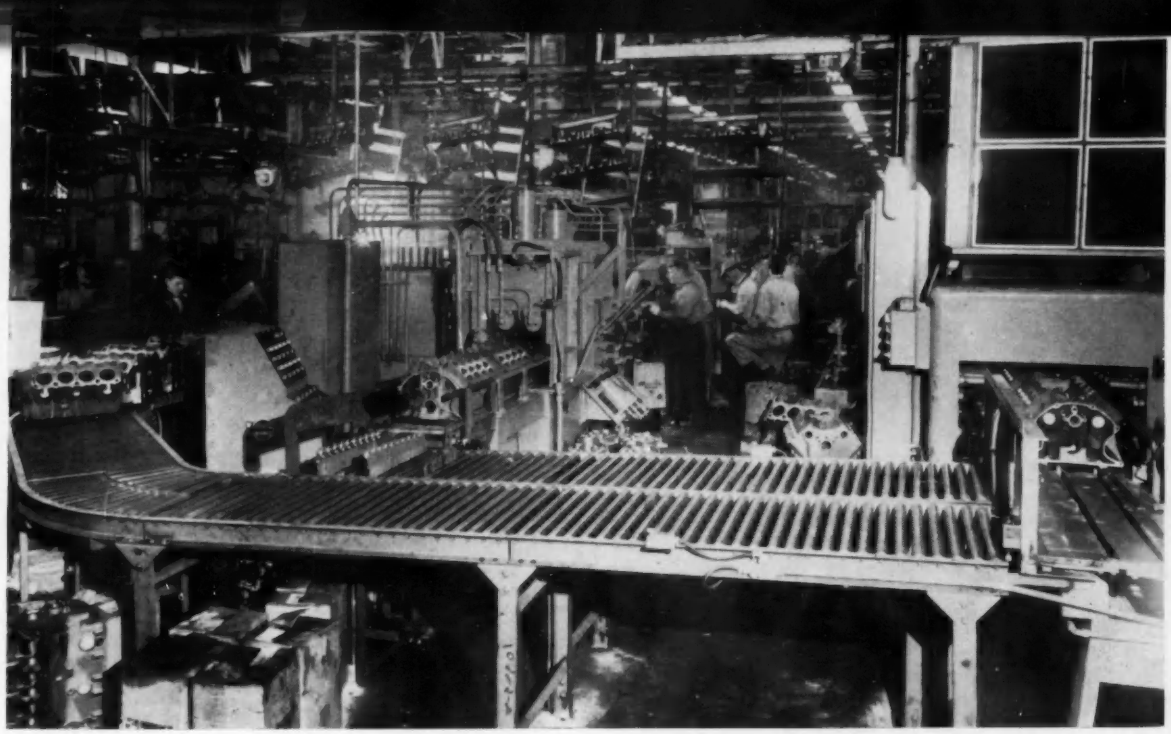
This article is the first of two studies dealing with a sampling of operations on a selected group of major components. In the course of this study it was evident that the management had skillfully tailored the manufacturing procedures, the machine tool equipment, and material handling methods to its own estimate of production requirements. Thus it will be found that cylinder block and cylinder head process lines feature an extensive installation of the latest types of transfer machines, while the smaller components are handled primarily on individual machines of single-purpose types.

As will be seen later, much of the transfer equipment is of what may be termed segmented type, i.e., the several transfer machines on a given line have definite breaks between them to permit visual examination before the parts are moved to the next machine.



View of the loading end of one of the 15-station Greenlee transfer machines on the cylinder block line. There are two of these machines used for drilling, reaming, boring, tapping, etc. There are 196 spindles in the two machines.

Cylinder bores are finish-honed in this eight-spindle Micromatic honing machine which handles one bank of two blocks at a time. At the right is the Sheffield Precisionaire gaging machine for gaging and grading bores.



Following washing in Centri-Spray index type washing machine, blocks are routed to the special W. F. & John Barnes machine, seen in the background, for pressing-in of welch plugs.

It is of interest too that all transfer machines that handle tapping operations are provided with automatic probing stations ahead of tapping stations. The usual turn-over and roll-over stations also are provided where required, together with blow-off to remove chips.

The entire arrangement has been developed in keeping with a conservative estimate of production requirements. On the smaller components where individual machines are employed, the capacity is of the order of 25-35 parts per hour, depending upon the type and make of equipment. In the case of transfer machines and high production equipment such as the Cincinnati horizontal surface broaching machine on the heads, it was found expedient to install sufficient capacity for producing at the rate of at least 50 an hour at relatively modest additional cost. Actual daily capacity is figured on the basis of two-shift operation.

In keeping with space limitations, this article is concerned exclusively with a sampling of cylinder block and cylinder head processing.

Initial operations on the cylinder block line are handled in two Ingersoll transfer machines. The first of these, a nine-station unit, mills locating spots; rough-bores the half-round crank bearings; rough-mills bearing cap seats; finish-mills the pan rail; shaves the sides of bearing cap seats; drills, reams, and chamfers two dowel holes; drills and chamfers bearing cap stud holes and oil pan holes.

The second machine, an eight-station Ingersoll, rough-mills the bank surfaces; rough-bores cylinder bores; bores the top radius; rough- and finish-mills both ends; mills crank bearing ends and notches.

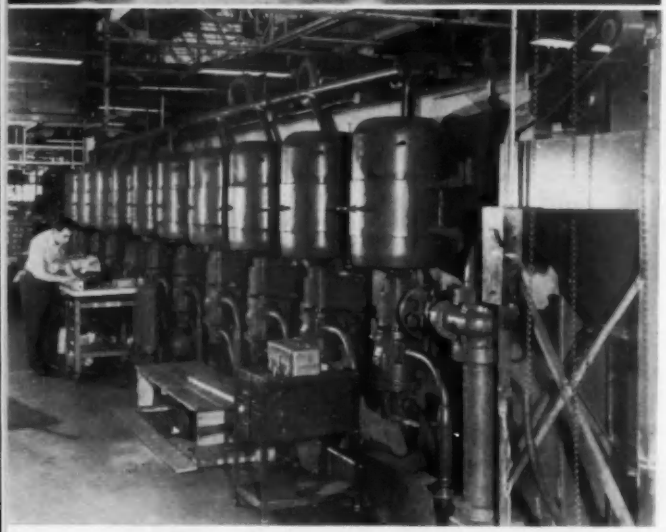
This is followed by a 25-station Natco transfer machine to take care of the following group of operations on both ends: core-drill front, rear, and intermediate camshaft bearings; core-drill and finish-ream two Welch plug holes; drill and ream two locating holes in front of block; drill, chamfer, ream, and tap all holes in ends of block.

From this machine the blocks are transferred by means of short section of power conveyor to a two-station Greenlee machine tooled for milling, drilling, reaming, chamfering and tapping with some 60 spindles in action.

Next in line are two 15-station Greenlee transfer machines. First of these machines, with 144 active spindles, does the drilling, reaming, countersinking, and tapping of a variety of holes — primarily valve tappet holes and stud holes. The second Greenlee unit, with some 52 active spindles, handles drilling, reaming, boring, and tapping operations as well as for finishing the tappet holes.

At this point the bearing caps are assembled and the blocks enter a nine-station Ingersoll for cam- and crank-bore operations, including finish-boring of cylinder bores.

Cylinder bores are finish-honed in a large Micromatic honing machine, fitted with a hydraulically-operated eight-spindle honing fixture. The object of this is to hone two blocks at a time, taking one pair of banks at a time, then indexing the trunnion fixture to present the other bank while still clamped in the same fixture. Since the honing operation is sensitive to close tolerances on size as well as surface finish, there is an installation of a large Barnesdril magnetic filter-



Top—This familiar horizontal type Cincinnati surface broaching machine handles the first operation of the cylinder head line.

Bottom—Here is a view of the rear side of the Cincinnati surface broaching machine. This was taken to show the arrangement of the ten, 50-hp Howell motors which drive Vickers hydraulic units at the lower end of each one.

ing unit to keep the coolant clean; and a Frostrode refrigeration cabinet, thermostatically-controlled to maintain the coolant at constant temperature.

Cylinder bores are held to a tolerance of 0.001 for size and maximum taper, no reverse taper being tolerated. Out-of-round is held to 0.0005 in.

Blocks then are given their first wash in an automatic Centri-Spray index type washing machine, then proceed to a special W. F. & John Barnes machine for pressing in eight Welch plugs.

Blocks are air-tested for leaks and moved into a six-station Ingersoll processing machine for the following operations: press-in camshaft bushings; finish-bore crank bearings and cam bearings; ream two dowel holes; finish-mill cylinder banks. The blocks are put through the Centri-Spray washer again and are ready for the engine assembly line.

Although the cylinder block line does not employ surface broaching, one of the huge Cincinnati horizontal surface broaching machines is very much in evidence on the first operation on cylinder heads. This machine is of familiar design well known to our readers. Of three-station type, it broaches the top, bottom and sides of cylinder heads. A distinctive feature of this machine, however, is the employment of full hydraulic actuation of the enormous ram instead of the usual planer type drive.

Hydraulic ram actuation was specified deliberately by AMC engineers in keeping with an established policy of using hydraulics wherever feasible. One of the chief reasons for emphasis on hydraulics here is that many years of experience have demonstrated that in the Kenosha operation hydraulic actuation has been associated with lower maintenance costs.

As shown in the rear view of the machine, there is an installation of 10 Howell motors of 50-hp capacity, providing a total of 500-hp for driving the Vickers hydraulic equipment which, in turn, provides the pressure fluid for ram actuation.

From broaching the heads enter a unique four-station W. F. & John Barnes machine fitted with a rotary indexing table. It may be noted in passing that AMC engine designers require precise positioning of the combustion chamber with respect to the mating faces. The function of this machine is to locate such initial operations by precise positioning of the work in the fixture, locating from the combustion chambers.

The first station is used for loading and unloading. At the three working stations some 33 active spindles are employed for a variety of drilling, reaming, chamfering, and countersinking operations, including the reaming of three assembly dowels and two manufacturing dowels.

Having prepared the cylinder heads with dowel locators as well as with some miscellaneous holes in odd locations, the work enters an extensive 26-station W. F. & John Barnes transfer machine which completes all of the remaining machining operations, including the milling of both ends at the first working station. With about 120 active spindles, this machine handles the gamut of drilling, countersinking, spotfacing, counterboring, tapping, and boring operations. These include the machining of valve throats, valve spring seats, spark plug holes, and the many fastening holes.

It may be noted at this point that AMC has installed W. F. & John Barnes Detecto-Boards, for locating electrical troubles, to serve each of the W. F. & John Barnes transfer machines, as well as a smaller unit for the four-station machine.

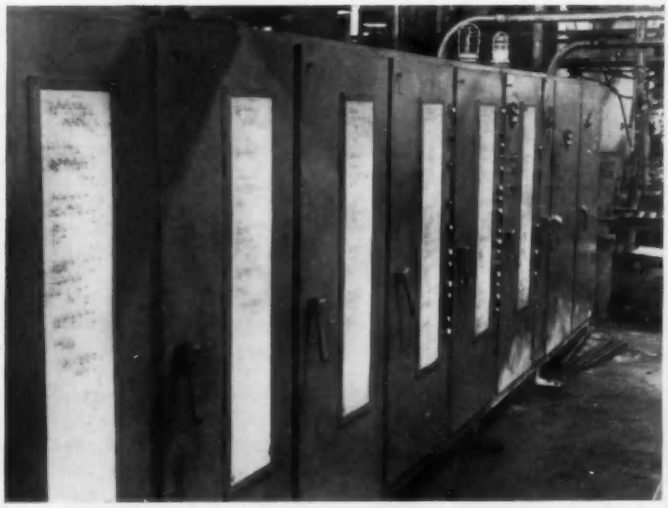
At the end of the head line the work is put through a Cincinnati tunnel type surface broaching machine to finish the gasket face. This is the usual operation for removing all scratches and nicks accumulated during

Above—Special four-station W. F. & John Barnes machine arranged for performing the initial operations on cylinder heads. Above, right—Operations on cylinder heads not handled on the special four-station machine are completed in one pass through the 26-station W. F. & John Barnes transfer machine seen here.

the passage of the work, through the variety of operations, also affording a means for finishing the face to the proper dimension with respect to the depth of the combustion chamber.

AMC management has done considerable advance thinking in connection with the costly installation of equipment for machining the cylinder block. At the present time the V-8 engine has a nominal bore of 3.5 in. However, there is always the possibility that a larger bore size may be required later. To meet this contingency, the present equipment has additional heads already built in for boring a larger diameter. Moreover, a system of electrical interlocks also has been incorporated to make it possible eventually to run both sizes through the same machine without changing heads or changing machine cycles. This is one of the things that makes for flexibility and relieves engineering of the hazard of frozen design.

The second installment of our study of this plant, to appear in an early issue, will cover a sampling of operations on connecting rods, pistons, and crankshafts.



Above—Detecto Boards for quick identification of faults in the electrical system are installed to serve each of the W. F. & John Barnes transfer machines, as well as a smaller unit in the four station machine in this department. Above right—Gisholt Dynteric balancing machine for final balancing of partially assembled V-8 engines is installed at the final assembly line as shown. The assembly is removed from the conveyor by hoist and is ready for installation in the balancing machine cradle. Balanced engines then return to the assembly line to complete the assembly cycle.

Present and Future Designs Discussed at

SAE National Aeronautic Meeting

By Charles A. Weinert

ENGINEERS and production executives analyzed latest aircraft designs, developments and problems at the SAE National Aeronautic Meeting held last month, as an aggressive step toward "meeting the challenge of aviation's barriers" and furthering aviation progress. Some 2000 were in attendance at the meetinig in New York City, where the program included technical papers on powerplants, new transports, vertical lift aircraft, accessories, and air transport operating aspects, as well as several panel discussions.

The annual Aeronautic Production Forum, sponsored by R. P. Lansing, vice president of Bendix Aviation Corp., had as its main theme the "Programming for Product Availability and Reliability." During the first day of the program devoted exclusively to this project there were seven panels held concurrently on the subjects of: manufacturing and engineering responsibility for reliability; techniques of modern manufacturing management; building reliability into aircraft control systems; production planning for product availability; new trends in tooling; quality control's role in product reliability; and automation and limited quantity production.

Two other panel discussions also were part of the overall program. One morning session was a case history approach to breaking the time barrier between design and production, and coordinating engineering with production. The second, a separate morning session, was concerned with fuels and fuel systems for turbine transports.

PRODUCTION FORUM

MOST of the interest at the Production Forum centered around manufacturing reliability. Engineers in general agreed that efforts toward achieving reliability must be started at the design stage. Reliability should be specified in procurement specifications. Of course, the problem is in the definition of the word and then measuring it. There has been some progress made toward the synthesis of field conditions so that engineering tests in the laboratory will duplicate those in the field. With any measure of reliability it was stated that there is a fantastic amount of detail in order to isolate individual problems. One of the approaches being carried out by the Air Force is new field reporting methods on the failure of components. By the new method a qualitative analysis is prepared concerning each component that has failed in service. During the course of the panel session, there was a great deal of interest in the definition of the word, and the basic question still remains how reliable should a component be to be reliable?

There was very little interest at the Production Forum on the subject of automation, since this technique does not lend itself to all aircraft manufacturing methods. There was some talk about electronic numerical control or tape control for items requiring frequent design changes and thereby a limited production.

In the tooling session, it was rather significant that the engineers had a desire to try any new developments in tooling for aircraft. There seems to be a definite trend toward the use of more ceramics and plastics. One engineer stated that he believed that the old materials are still of great value and that all that we require are changes in tool design. In this respect, he told about a standard hss end mill which had a flute shape revision and was capable of cutting a 1662 lb piece of aluminum down to 162 lb finished part. One of the newest developments in the field of tooling which was widely discussed was on modular fixturing. This type of fixturing is most advantageous in the aircraft and job shop field, where, because of limited production, there is often a number of changes in building up fixtures for components.

QUALITY CONTROL

THE Quality Control panel meeting tied in somewhat with the question of reliability. One of the new approaches in this field was the aging of equipment. It was felt that the defects must be inspected out of a product in addition to building in quality. The usual responsibility question was also

brought before the panel members as participants in the discussion wanted to know where reliability belongs in an organization. This question obviously went unanswered.

A survey, disclosed in the session on the techniques of modern manufacturing management, stated that scientific workers want, in order of their importance, steady work; good working conditions; a good boss; opportunity for advancement; and last of all, money. It was felt that management must create motivation for such workers by building self-interest in various technological programs.

POWERPLANTS

AIRCRAFT powerplants, both current and future, were given concerted attention during the technical sessions. The Eland turbo-prop engine and its application to air transports were described by A. J. Penn of D. Napier & Son, Ltd., who pointed out that in one conversion from piston engines an immediate weight saving of 2000 lb was realized. A comparison of performance, using a converted Convair 340, showed an increase from 240 mph with the piston engine version to 290 mph with the Eland 3500 ehp version; along with the maintenance of a payload of 12,900 lb over 1000 miles stage distance, whereas with the piston engine version the payload fell to 10,000 lb for the same distance. According to Mr. Penn, a 4200 ehp Eland with an 8.0/1 pressure ratio, a specific fuel consumption of 0.56 lb/ehp-hr and a specific weight of 0.43 lb/ehp is in the course of development.

The Allison power package for the Lockheed Electra, consisting of the 3750-hp 501-D13 turbo-prop engine and the Aeroproducts "606" turbo-propeller, was described in some detail by R. M. Hazen, D. Gerdan and R. R. LaMotte of Allison Div., GM. The weight saving in the Electra turbo-prop nacelles, compared to the latest type of reciprocating engine nacelles, exceeds five tons per airplane, they stated. It was disclosed for the first time that after about two years of production of the 501-D13 turbo-prop engine, it will be changed to a higher-rated model, the 501-D15. Present components aside from the gas turbine power section were designed from the start for the -D15 engine ratings, so that these will continue to be usable with the future power section when it is available, they explained.

The development history of Rolls-Royce turbo-prop engines was thoroughly covered by D. P. Huddie of Rolls-Royce, Ltd., who reviewed performance developments up to and including the Tyne engine. He outlined how improvements in power output and fuel consumption were attained, and how problems with service life of certain parts were met. In speaking about approach conditions, where it is desirable to have available a relatively high propeller speed for rapid acceleration in case of a balked landing, together with minimum fuel flow to give propeller drag for normal approach, which combination would tend to cause the low-pressure compressor to surge, he stated that one feature had been incorporated in the Tyne engine controls which was worthy of mention. This consisted of fitting a bleed valve between the two compressors which was controlled automatically by corrected speed signals from the two compressor shafts, to enable the achievement of engine conditions desirable for approach, with a high low-pressure system speed to insure rapid acceleration in the event of a wave-off.

M. G. Beard and F. W. Kolk of American Airlines, Inc., concluded that gas turbines are potentially more reliable than piston engines, principally because a number of potential troublesome items of equipment are eliminated in the simpler type of powerplant. They urged, however, that careful design consideration be given to such things as containment, shrouded compressor stators, and compressor surge limits.

One technical session was devoted to compressor stall problems in gas turbine engines and approaches to their solution. William A. Benser and Harold B. Finger of the National Advisory Committee for Aeronautics pointed out that recent emphasis on high altitude flight and increases in flight Mach numbers have shown severe adverse effects on compressor stall limits. Kenneth L. Jones, Major, USAF, of Wright Development Center, likewise stressed the seriousness of turbine engine stall not only in aircraft reliability, but also in system development time losses. W. A. Gebhardt and R. Bodemuller of Bendix Aviation Corp. presented three modes of stall control, and indicated that a closed loop control using an incipient stall "sensor" is now under development.

Perhaps the most spectacular paper given during the sessions was one by Lee A. Ohlinger of Northrop Aircraft, Inc. He stated that "educated guesses" indicate that some kind of prototype nuclear-powered aircraft should be with us within three to ten years and may even be flight-tested as early as 1958-9, the lower figure being only applicable to military aircraft. Problems are involved which prohibit the use of nuclear power in fighters or lightweight craft and restrict it to medium or heavy bomber type aircraft, but the almost unlimited endurance of nuclear powerplants provides unlimited range and other desirable operating characteristics, he said. Mr. Ohlinger, in looking into the future, visualized nuclear-powered tow planes, for example, with towing facilities for commercial airliners which would only carry enough fuel for take-off, landing and limited cruising.

TRANSPORTS

DESIGN considerations in evolving a short to medium range turbo-prop air transport, which would give an increase in cruising speed to about 400 mph with approximately the same or a small increase in direct operating costs, indicate the desirability of using wing-tip-mounted small turbo-jet engines, according to G. D. McVicker of Convair Div., General Dynamics Corp. These would supplement two J-44's or equivalent.

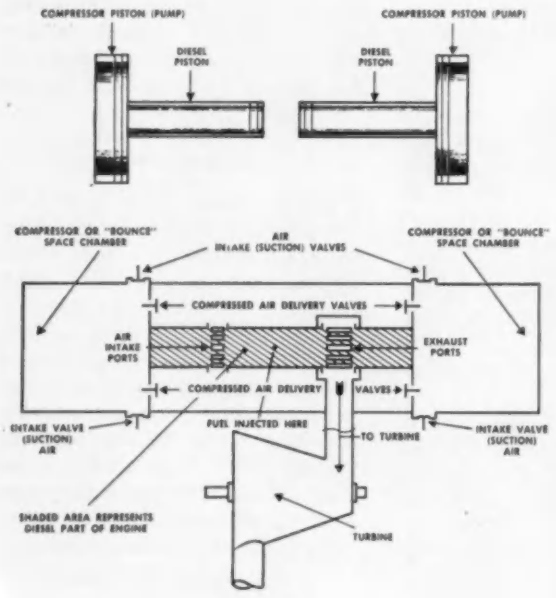
Jet transports, with aerodynamic

(*Turn to page* 141, *please*)

The engine is located under the hood with a pipe to the turbine at the rear of the car

World's First Automobile with Free Piston Engine

Arrangement of components in the engine.



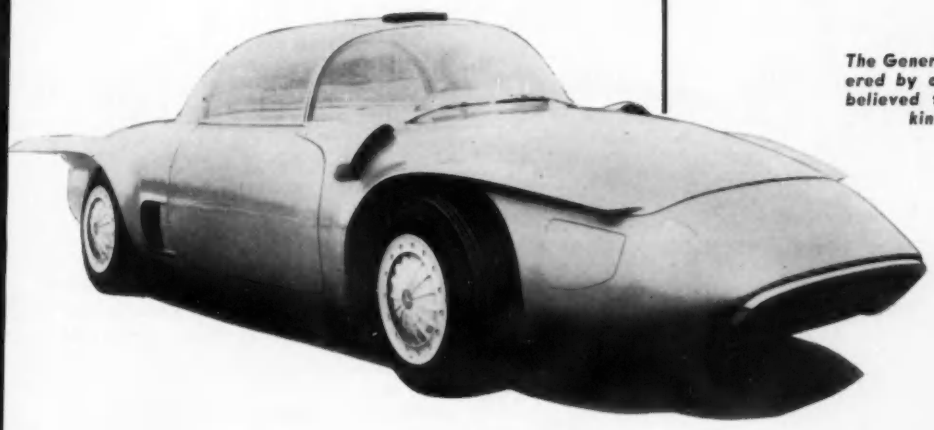
GENERAL MOTORS' XP-500, the first automobile to be powered by a free piston engine, will be displayed at the May 15-16 dedication of the new General Motors Technical Center.

The engine, which develops 250 hp, consists of two parallel cylinders, each containing a set of two horizontally opposed pistons, a departure from previous free-piston engine design.

Heretofore this type of engine has been used primarily in Europe for such applications as powering ships, locomotives, stationary power plants and portable air compressors. These units usually consist of a large single cylinder or banks of disconnected single cylinders each containing two pistons.

A free piston engine can use a wide range of fuels. In tests at Technical Center a unit has run on all types of mineral oils from high octane gasolines to so-called bunker "c" or residual fuels.

Although it is in the very early experimental stage, the engine offers some interesting possibilities with a new form of power not only for passenger cars but also for buses, trucks and military vehicles.



The General Motors XP-500, powered by a free piston engine, is believed to be the first of its kind in the world.

Known as the GM-10-10, it has few high precision parts as compared with conventional automobile piston engines and gas turbines. Also, it is inherently balanced so that it operates virtually without vibration, and the comparative absence of rotating parts would cause little wear of rubbing metals.

The pistons are arranged opposite one another in horizontal cylinders. An air-fuel charge fired between them—with injectors similar to those used in Diesels—drives the pistons apart, compressing air at the ends of the cylinders.

The compressed air bounces the pistons back toward inner "dead center" and as they travel inward they also compress air that pumps into a Diesel cylinder. The back-and-forth movement continues to compress air which is piped to a turbine.

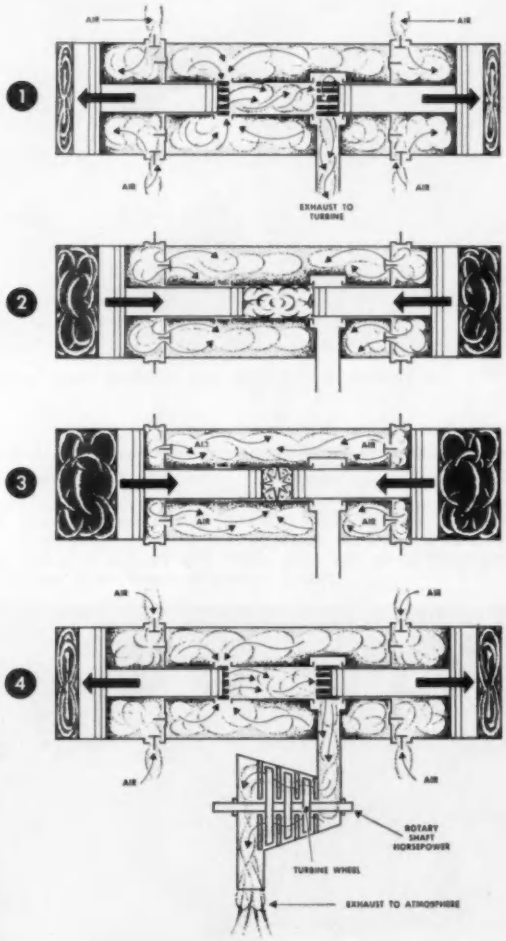
Because these exhaust gases pumped to the turbine are relatively cool, no higher than 900 F, the turbine blades can be made of non-critical, non-strategic materials.

The two pistons bouncing back and forth in the cylinder are kept in phase with a connecting device.

In the XP-500 the free piston unit is under the hood. A pipe to the turbine runs along one side of the chassis frame, thus giving the passenger compartment a "flat floor." In the rear compartment the turbine is combined with the transmission-axle unit, transmitting power to the rear wheels.

References

French gas turbine truck has two free-piston engines; 2-15-52; page 52
Design analysis of free-piston engines; 7-1-50; page 46



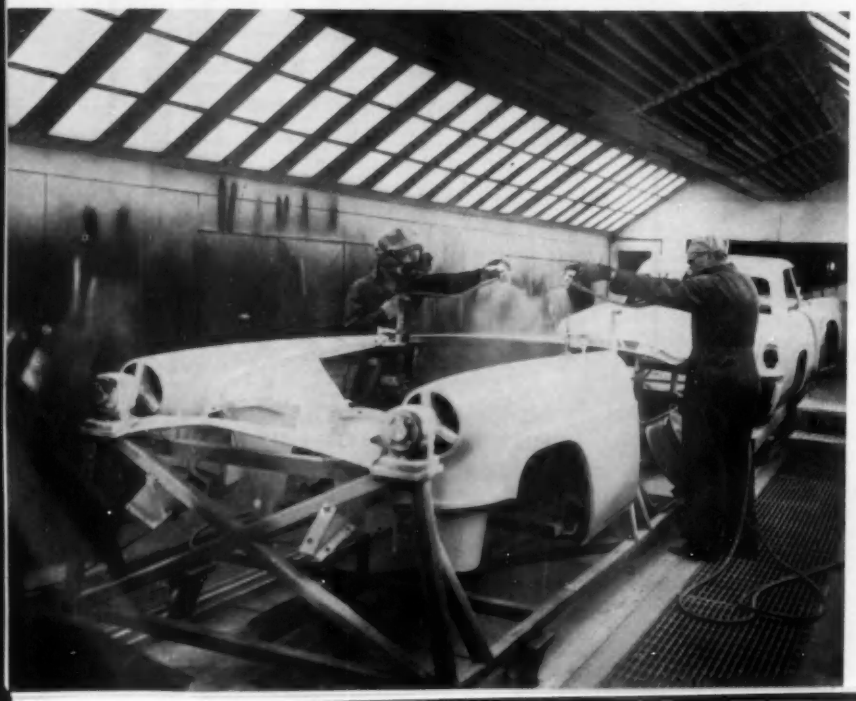
SCHEMATIC ILLUSTRATIONS SHOWING OPERATION OF THE FREE PISTON ENGINE

Above, right—(1) Pistons are completing their travel outward and are about to bounce back. Intake and exhaust ports are open—intake air is filling compressor cylinder. (2) Pistons travel inward pumping air from the compressor cylinder into the air box, trapping air in Diesel combustion space. Intake and exhaust ports are closed—air delivery valves are open. (3) Pistons are completing inward travel. Fuel is injected into cylinder. This is combustion or the beginning of the power stroke. Intake and exhaust ports are still closed—air delivery valves are open. (4) End of power stroke compressing air in bounce space to return pistons for next cycle. Exhaust and intake ports are just opening to scavenge Diesel cylinder. Exhaust gases escape to turbine, spinning turbine wheels for usable power. Air is being drawn into compressor cylinder.

Unusual Production Techniques for

Oil sand deck; the body and its sheet metal move together.

Here is the way painting is done. In the background is the body shell; in the foreground is a special carriage that holds the sheet metal parts which had been originally fitted to the body shell. The two go together through all paint shop stages to assure exact color match.



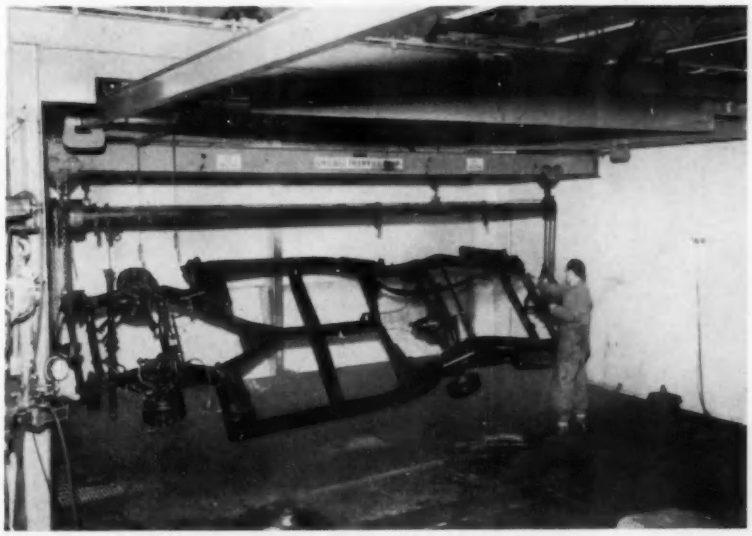
IN keeping with the exceptionally high standards established for the Continental Mark II, such operations as the finishing and trimming of bodies, and chassis and car assembly, involve manual skills and hand work including hand torquing of most fastenings. According to the company, more than 100 man-hours are required just for assembly operations.

The entire process is under the scrutiny of inspectors at various stages, making quality control one of the basic features of the setup. The objective is to manufacture a custom built car that is ready for the owner without the usual preparation by the dealer. To this end, each car is enveloped in two separate covers—one, a canvas cover with a fleece lining; the other a plastic cover for weatherproofing while in transit.

The process starts with the delivery of the body, which has been assembled by Ionia Mfg. Co., to the assembly plant. First, it is taken over a short metal finishing line, where solder is wiped over numerous joints and areas to produce well faired surfaces.

A distinctive feature of Continental body finishing is that front fenders, hood, and deck lids are accurately and selectively fitted to an individual body on the metal finishing line. This is done with the body fastened to massive bucks, similar to the chassis frame. After the sheet metal has been fitted, it is removed and mounted on a special dolly which follows the body through all painting and hand rubbing operations to assure a satisfactory color match. Later, the sheet metal is attached to the body on the assembly line.

the Continental Mark II



Final assembly begins with the painting of the chassis frame in this Peters-Dalton booth. The craneway transports chassis assemblies from the short assembly line out of this view.

The manufacturing area is small by mass production standards, about 190,000 sq ft in area. One of the most interesting sections of the plant is the compact body finishing department, located in the upper right-hand corner of the floor plan. All of the spray booths, drying ovens, as well as the overhead equipment for supplying fresh, filtered air at a standard temperature of 78 F, were designed to Continental specifications and installed by Peters-Dalton. It may be of interest that the repair drying oven is steam-heated, while the other ovens are gas-fired.

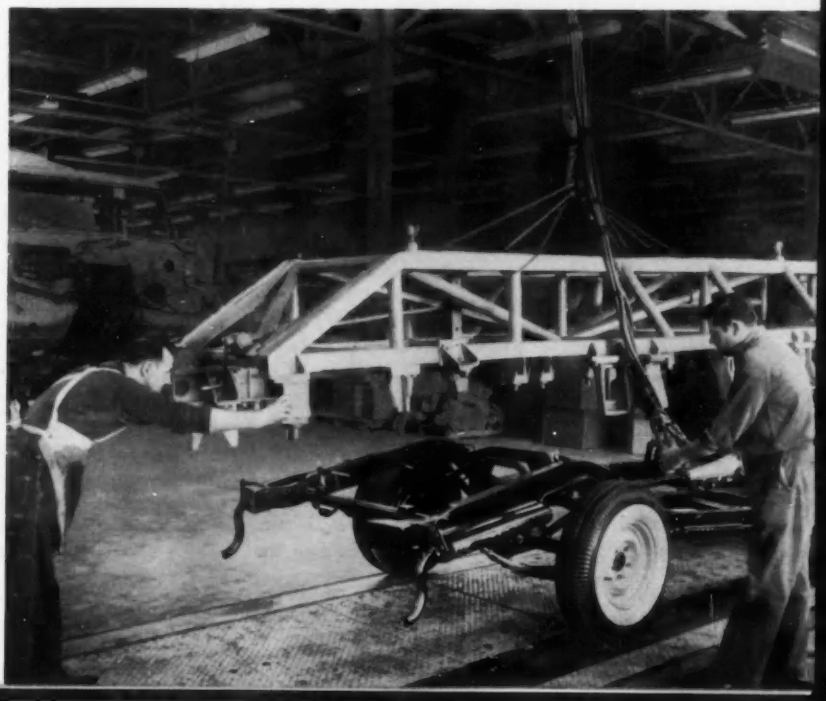
The first operation in the finishing department is the cleaning and Bonderizing of the body shell and sheet metal. This is done in a relatively short unit, supplied by Schmieg, providing a five-stage operation. During the course of the cycle the work is continuously oscillated on a conveyor section provided with pneumatic actuation.

This is followed by application of a combination primer and surfacer coat followed by a bake. Final lacquer coats are applied in the form of two individual double coats of color. Each of these double coats is individually baked and hand sanded, using oil sanding.

Skilled craftsmen in the cut and sew department make up the various interior trim items individually, cutting to standard patterns. Selected leather hides, mostly imported, are employed exclusively; and portions of each hide are selected for an individual car to assure a perfect color match. Similarly, fabrics used for upholstery are cut from carefully inspected portions of a roll to assure color match.

While bodies are being processed in one part of the plant, the chassis and its components

(*Turn to page* 116, *please*)

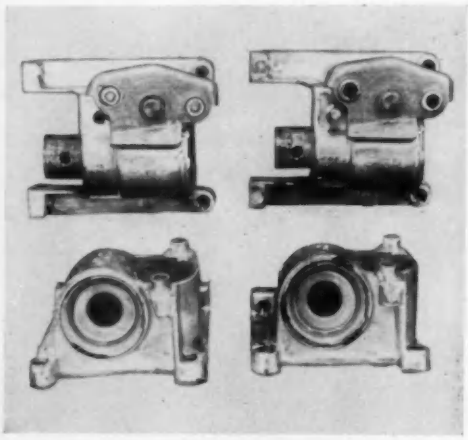


One of the major quality control steps is seen here. Just before the body drop, each frame is checked by means of the overhead fixture to determine alignment and to measure the exact amount of shims required for each body fastening point.

Efficient Assembly of Parts

By Staking in Hydraulic Presses

Setup in a hydraulic press equipped with a 12-station dial used to fasten stampings to die cast regulator housings by heading two hollow studs after the stamping is placed over them.



Top and side view of die cast ventilator regulator gear box housings. Upper pair show a stamping before and after recessed studs are headed to fasten it. Below is a side view of the same housing before and after a circular stamping is staked in place.

SEVERAL jobs in which fast assembly is required are done effectively in the new Ternstedt Div. plant in Flint by the use of light hydraulic presses equipped with dials that, after parts are loaded at one or more front stations, automatically index the parts under a tool or tools operated by the press ram. Such setups are safe and convenient besides effecting assemblies of uniformly high quality and at high speed and in large volume.

In one such setup an operator unloads assemblies and reloads each of the 12 fixtures on the dial as they pass her station. Two other operators place a steel washer and a stamped component on each die cast "CV" ventilation regulator gearbox body as it is advanced. Two holes in the stamping are set over studs that are integral with each casting. Each stud has a recessed end that forms a shallow collar passing through the hole.

At each indexing, a casting on which the steel parts have been placed comes under the press ram, which is above the rear of the dial and well away from the loading stations. The ram carries two punches whose ends are so shaped that they press or stake the ends of the two studs outward, thereby fastening the steel parts firmly and permanently in position.

Further indexings bring the assembly to the unloading station where it is removed and another casting is put in place. In this way, nearly 1300 assemblies an hour are produced. Pressure applied can be set at any tonnage up to press capacity and then remains constant.

No damage to the dial or press can result, because the pressure set is never exceeded. Also, as the stroke is also adjustable, neither the punches nor the fixtures are damaged if any fixture remains unloaded when it passes under the ram. Uniform work is insured because the punches always apply the same pressure.

In a similar setup, a circular stamping is staked at three points to the side of the regulator body using a press equipped with a dial having suitable fixtures. In this case, one operator loads the cast bodies into the fixture and a second places the stamping in the recess made to receive it. Three staking punches strike the piece at points 120 deg apart when the casting stops at the staking station. After the punches retract, further indexing causes the assembly to pass over ejectors that lift it free of the fixture and cause it to drop onto a belt for advance to the next operation. As before, staking is uniform and is done rapidly. Operators quickly learn to load the parts at the set speed for dial rotation.

Still another setup uses another light press having a six-station indexing dial to assemble a short steel shaft to a circular hollow die cast button having a

Indexing dial setup in a press that forces a short shaft into the central boss of a die casting. Then the punch collapses to force metal below a shoulder on the shaft, fastening it permanently to the die cast button.

central hollow boss concentric with and inside the cylindrical portion. After the button is loaded in a fixture, the shaft, which has a turned shoulder, is inserted in the hole by hand.

When each fixture is indexed under the press ram, the latter is lowered and presses the shaft home in the boss hole. Further motion causes the punch to collapse below the shoulder, pressing the thin boss wall inward at this point, thus locking the shaft permanently in the boss. At the next station, an ejector lifts the assembly free of the fixture so that the work piece drops into a chute, leaving the fixture ready for reloading. Dial motions are automatic; setup enables the operator to produce about 900 assemblies an hour.

• • •

Two Heavy-Duty Engines Marketed by Caterpillar

Two new heavy-duty V-type engines have been announced by Caterpillar Tractor Co. Capable of producing up to 650 hp (maximum), the new units are available in turbocharged, roots-blown, naturally aspirated and spark-ignited versions.

The new eight and twelve-cylinder D375 (Series D) and D397 (Series D) Engines are of four-cycle design, as were their predecessors, the D364, D375, D386 and D397. Principal differences between the new engines and the former models are in the cylinder heads, exhaust manifolds, method of supercharging, and in the case of the spark-ignited engines, the fuel used and the method of igniting it.

Diesel Engine Business Is Sold by Hallet Co.

American M. A. R. C., Inc., has purchased the Diesel Engine Div. of Hallet Manufacturing Co., Los Angeles, a subsidiary of Moore Machinery Corp.

American is now leasing Hallet's plant. It states, however, that it will build a new 50,000-sq ft unit, with $500,000 worth of machinery, in the Los Angeles area within the next half year.

Tandem-Axle Six-Wheel Models Are Announced by Dodge Div.

Dodge has introduced a new line of tandem-axle, six-wheel trucks ranging from 31,000 to 46,000 lb (max) GVW and up to 65,000 lb (max) gross combination weight.

New V-8 engines ranging up to 220 hp power the new line of six-wheelers. They are offered to the public in a wide range of power, wheelbases, and capacities.

Five-speed transmissions come as standard equipment. Available as factory-installed extra equipment is a complete line of three-speed auxiliary transmissions.

Standardized Automatic Transmission for New Clarklift Trucks

New Clarklift truck of 4000 lb capacity

AN improved fully automatic transmission "package" is standard equipment in a new elite line of Harley Earl-styled fork-lift industrial trucks to be introduced by Clark Equipment Company's Industrial Truck Division at the Materials Handling Institute Exposition in Cleveland, June 5-8. The transmission is designed with sufficient torque capacity so that one unit is used in all six models of what is designated as the Clarklift Line.

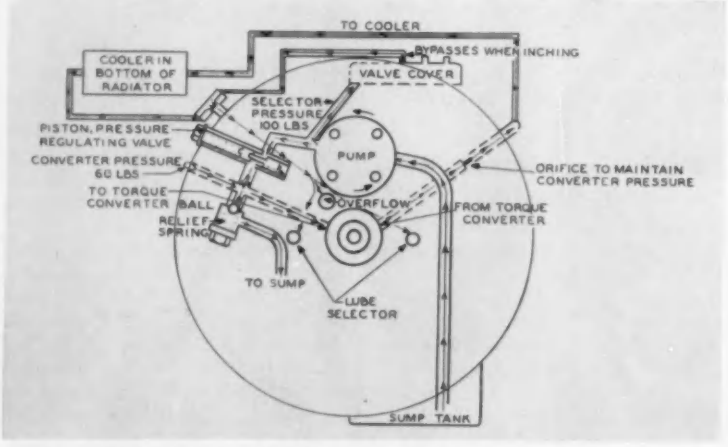
Heart of the transmission package is the Hydratork drive, a single-step, constant mesh forward-reverse gear set combined with a torque converter. Developed by Clark's Transmission Division, the transmission was first shown at the 1953 materials handling show in Philadelphia installed in the experimental X-70 model. The new version has been modified in the light of the experience gained after three years of production and operation experience.

The torque converter is a heavy industrial type single-stage, two-phase, three-member unit. The impeller acts as the outer shell of the converter and is bolted directly to the flywheel and turns at engine speed.

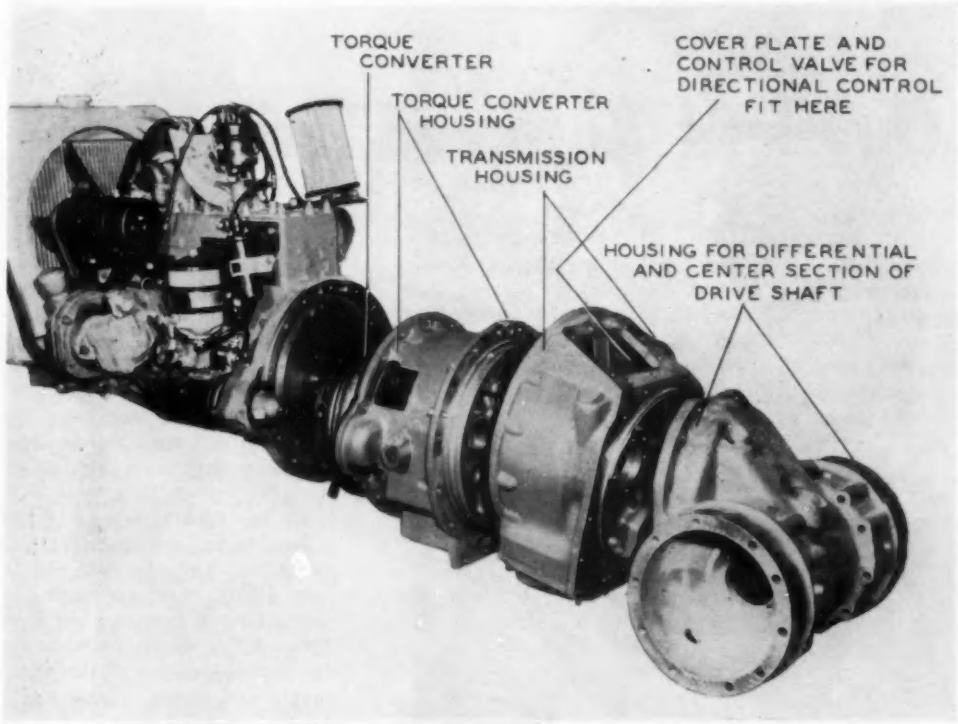
Power from the torque converter is transmitted to a one-piece, automotive-type main drive shaft-gear that rotates in the same direction for both forward and reverse. It is in constant mesh with both primary direction gears. Each of the primary gears is a one-piece spool gear, bushing-mounted on a countershaft. One end of the gear has straight teeth which act as a mount for a set of selector disks.

Whereas the primary gears are free to rotate because they are mounted on bushings, the secondary direction gears are splined to the respective countershafts. Each is a one-piece unit in the shape of a drum with a flange. They are positioned to enclose that portion of the primary gear on which the selector disks are mounted. The secondary gears are in constant mesh with each other through teeth cut on their flanges.

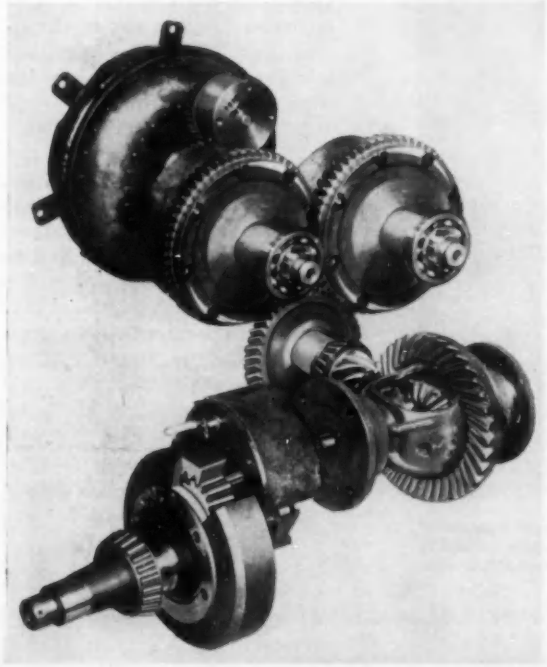
Straight gear teeth along the interior surfaces of the secondary gears act as mounts for a second set of selector disks. Primary and secondary disks alternate, and are separated by a series of springs.



Hydraulic circuit for transmission and torque converter


TORQUE CONVERTER
TORQUE CONVERTER HOUSING
TRANSMISSION HOUSING
COVER PLATE AND CONTROL VALVE FOR DIRECTIONAL CONTROL FIT HERE
HOUSING FOR DIFFERENTIAL AND CENTER SECTION OF DRIVE SHAFT

Basic power train package from torque converter to drive axle center section. Drive axle ends vary for each model.



Power train with one axle end

A portion of the secondary gear drum is ground to receive a piston so it can act as a hydraulic cylinder. The selector gear is splined to the shaft of the forward gear set. It is in constant mesh with the pinion shaft which drives the ring gear on the drive axle.

When the truck engine is running, the primary gear set and selector disks are free to rotate with the main drive gear since they are mounted on bushings. However, the counter shafts (and therefore the secondary gear set and selector disks which are splined to them), the selector gear, pinion shaft and drive axle, remain motionless. In effect, the transmission is in neutral.

To put the drive axle in motion, a primary and secondary gear set are coupled by forcing together a set of primary and secondary disks. This is accomplished when the driver flips a direction selector lever, located on the steering column, to either the forward or reverse position. Hydraulic pressure, directed against the piston in the gear drum, forces the disks together and against a heavy backing plate. Torque can now be transmitted from the primary to the secondary gears and out to the drive axle. To reverse direction of travel, the lever is flipped to the opposite position and pressure is bled off one selector disk pack and applied to the second pack.

A simple gear-type pump, which serves both the transmission and the torque converter, circulates hydraulic fluid at 125 psi to the direction selector valve. This is a slide type valve actuated by the direction selector on the steering column. Movement of the lever exposes one of two ports which lead to the drum-shaped portions of the secondary gears.

A constant bleed hole behind the pistons returns the hydraulic fluid to the circulation system. Hydraulic fluid leaving the torque converter is pumped to a conventional radiator-and-fan cooler. From the cooler, the

(*Turn to page* 104, *please*)

Chrysler's Advanced Facilities for

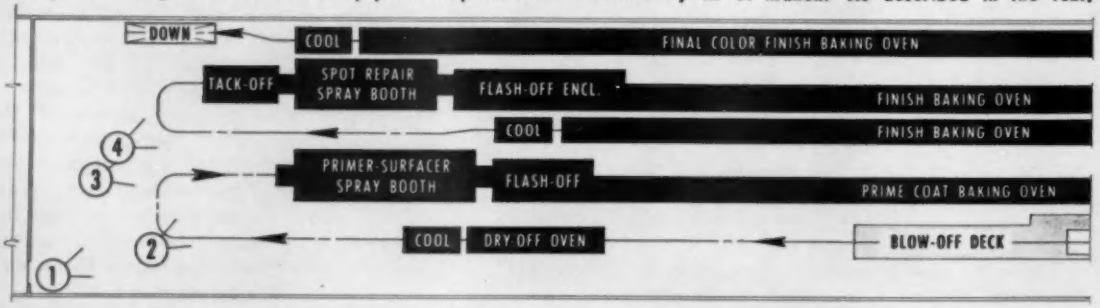
LATE last year Chrysler Corp. of Canada, Ltd., placed in operation a new addition to its assembly plant in Windsor, Ontario, housing an integrated body paint department as well as a self-contained paint shop for handling all sheet metal parts. Designed for a daily production of 480 cars—on a two-shi'+ basis—these facilities are of the most advanced character known to the art today, consistent with productivity. The facilities encompass the latest types of equipment for the purpose, an ingenious system of material handling, and skillful planning of work sequence and plant layout.

Bodies in white enter the long Bonderizing machine. All conveyor equipment in this paint department was installed by Jervis B. Webb. Near center, starting at floor level, is unique drag chain with pusher dogs that transport bodies

Body finishing has been compacted in one section of the second floor of the new addition in an area 960 ft long by 120 ft wide, the general scheme of the layout being readily visualized from the floor plan reproduced here. Bodies are assembled and prepared for paint on the first floor, delivered by conveyor to the location shown at the lower right hand corner of the sketch. From this point on bodies move on floor conveyors, automatically, from station to station until they are ready for delivery to the trim shop on the first floor.

It may be of interest at this point to note that all of the major items of equipment in the body shop—spray booths, baking ovens, cooling tunnels, etc.—were engineered and installed to Chrysler requirements by The R. C. Mahon Co., making this one of the most extensive projects handled by Mahon. All of the floor type conveyors in this department were installed by Jervis B. Webb. The conveyor system is quite distinctive in providing complete electronic

Floor plan of Chrysler of Canada body paint shop built and installed by R. C. Mahon. As described in the text,



Painting in Canadian Plant

By Joseph Geschelin

control of conveyor speeds in every section of the department, synchronizing the speed of all conveyors by means of synchro motors at various points.

As bodies enter the paint shop at the lower right, they go through the pre-clean deck, enter the six-stage Bonderizing unit, followed by passage through a 60-ft gas-fired dry-off oven. Here the bodies are held at 375 F for five minutes, finally emerging from the adjacent cooling tunnel. It is worth noting that cooling tunnels have been installed at the terminal end of every oven operation to reduce the temperature of sheet metal to a comfortable level for the operators. Cooling is accomplished by means of high velocity air jets.

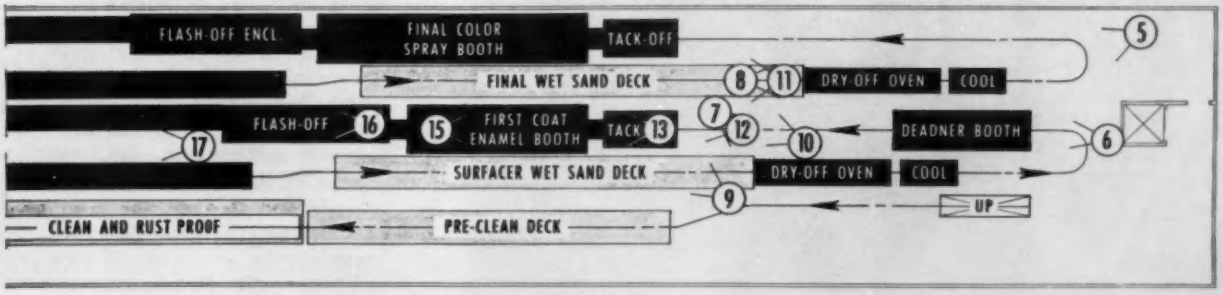
Bonderized bodies now take the bend on the conveyor at the extreme lower left, moving to the next row where they enter the 80-ft long primer-surfacer spray booth. This one is distinguished by the installation of DeVilbiss automatic spray gun mechanisms —one unit for painting the sides of the body, another for spraying the roof and upper sheet metal. Moreover, as bodies enter the booth the underbody areas are sprayed automatically by guns mounted near the floor.

Noteworthy feature of all spray booths is the utilization of traveling grates which move about four-inches per minute. In this installation, the grate system is in the form of a closed chain eventually traversing a chemical bath to remove paint continually.

This finish is baked in the surfacer drying oven, a unit some 330 ft in length, in which metal temperature is held to 250 F for 35 minutes. Next follows the

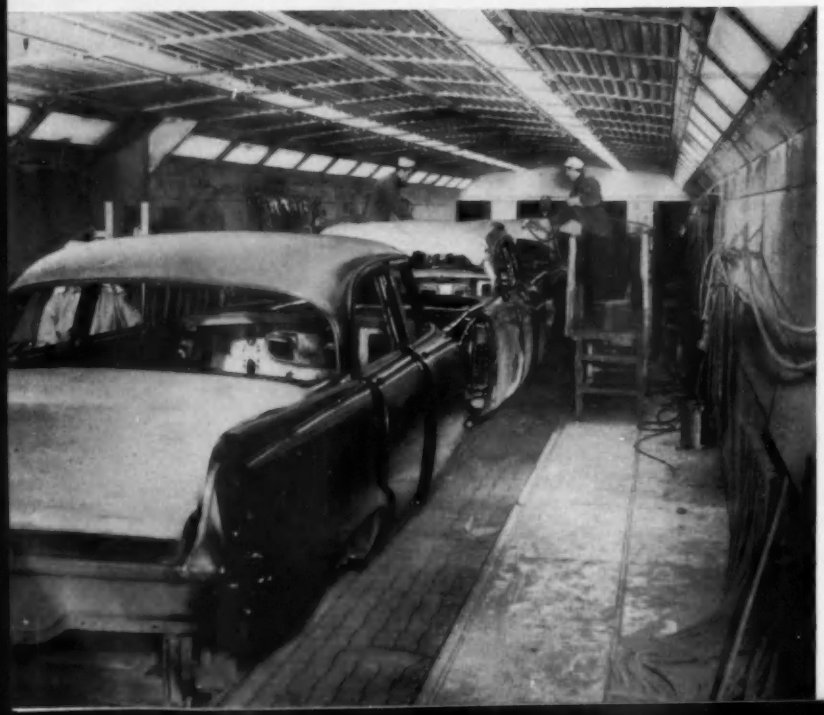
Bodies in the background, at the right, are leaving the Bonderite machine and make the first U-turn on their way into the primer spray booth in the left background. These are the booths equipped with automatic spray guns.

operations begin with entry of bodies at the lower right hand corner of plan, then proceed along flow lines as indicated.



Perspective of one of the dry-sanding decks in the body paint shop.

Final coat of enamel is applied manually in this big spray booth by experienced operators. Spent air and overspray are carried downward by the pressure air system, through the gridwork and into a fast moving stream of water. Excess paint is carried to sludge tanks, reclaimed and processed into sealer enamel.



wet sanding deck, dry-off oven, and cooling tunnel. Bodies, now at the extreme right end of the shop, are thoroughly sealed at critical points, then curve with the conveyor and move to the left to enter the sound deadener spray booth. Now they enter the tack-off booth, then move into an 80-ft sealer coat spray booth where the coating is applied by automatic guns, and are touched-up manually. Bodies then proceed through a 330-ft drying oven where metal temperature is held at 250 F for 35 minutes.

Leaving this oven, bodies go through the cooling tunnel, move along the ding and repair line, follow the conveyor bend at the extreme left for another run from left to right. First stage on this line is tack-off, spot repair and two-tone in a spray booth 60-ft long, and in the spot repair and two-tone drying oven 330 ft long. As bodies leave this oven they enter the final wet sanding deck, then progress through the dry-off oven and cooling tunnel. This takes them to the extreme right and the final bend in the conveyor to transport bodies along the upper line in the layout.

First operation at the right is the long masking line in which the various kinds of masking operations are performed. This is followed by tack-off and entry into a 120-ft long final color spray booth where the finish coats are applied manually, according to specifications for the individual car. The final color drying oven is longer than the others—380 ft—and holds metal temperature at 250 F for 40 minutes. Before entering the last drying oven, bodies remain for some eight minutes in a flow-off area to eliminate the possibility of orange-peeling.

After drying, bodies go through the last cooling tunnel and are inspected as they come out. At this point the masking tape is removed and they are ready to move down to the lower floor for trimming.

A noteworthy feature of this

operation is the provision of a separate paint mixing and storage building—120 by 80 ft, two stories high. It contains two tanks of 50 Imperial gallons for each of the 20 or more high gloss, synthetic enamel standard colors, one tank pumping paint through the entire system while the other is mixing. About 27 miles of piping is required to carry paint through the entire system.

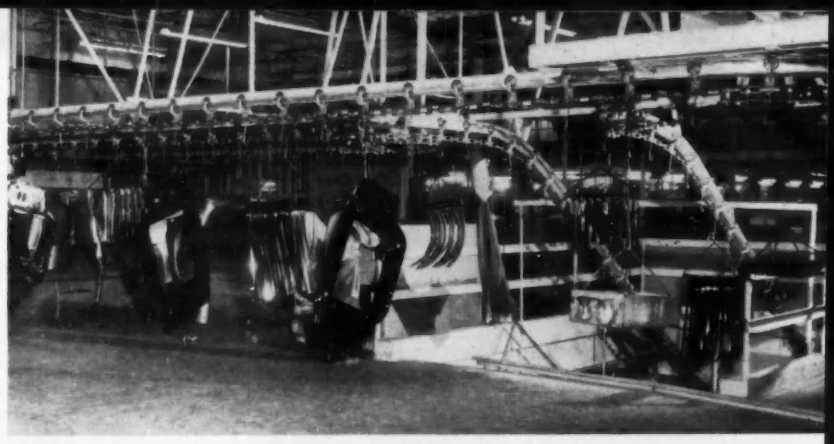
All of the paint spray booths are of water-wash type with a powerful cascade of water under the floor grating. This stream of water carries away the overspray to a storage tank system where much of the gray enamel is reclaimed. In fact, about 10 barrels of usable gray enamel are salvaged for every 14 gallons of sludge handled in the system.

Mention was made earlier of the J. B. Webb synchronized conveyor system in the body paint shop. An interesting feature of this conveyor is the arrangement for moving bodies into the Bonderite machine. They move upward on the conveyor line, being pushed by means of dogs which are carried on a separate chain. As bodies reach the upper bend in the conveyor, the pusher dogs automatically disengage and move away. Just before this point is reached, however, another chain carrying a different set of pusher dogs comes into play to move the bodies completely through Bonderizing.

Housekeeping in the paint shops is worthy of special comment. Careful planning, attention to detail, and above all the installation of an outstanding system of filtered fresh air supply not only is conducive to good housekeeping, it protects the character of the finish and provides the workers with an atmosphere that is cleaner and purer than it is in most other manufacturing areas.

The air supply for ventilation comes from an installation of eight air supply rooms on the roof of the plant. Fresh air is

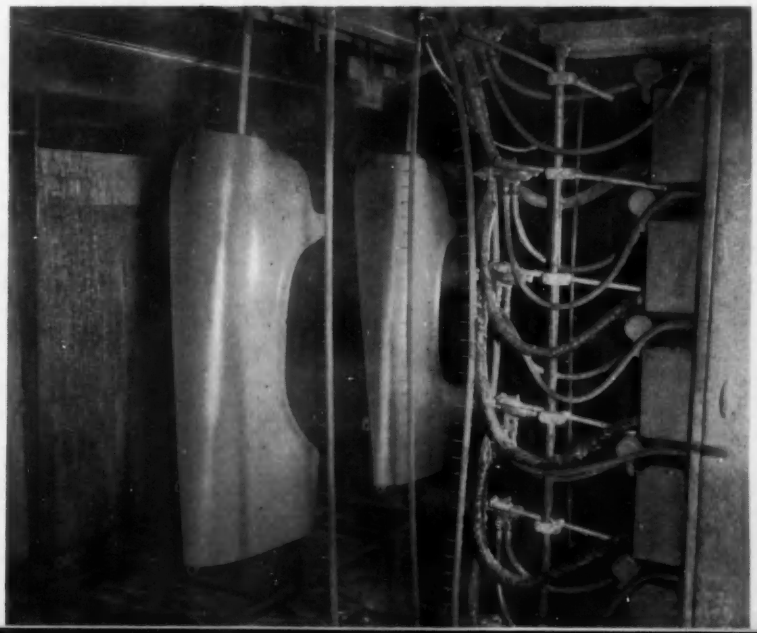
(*Turn to page* 114, *please*)

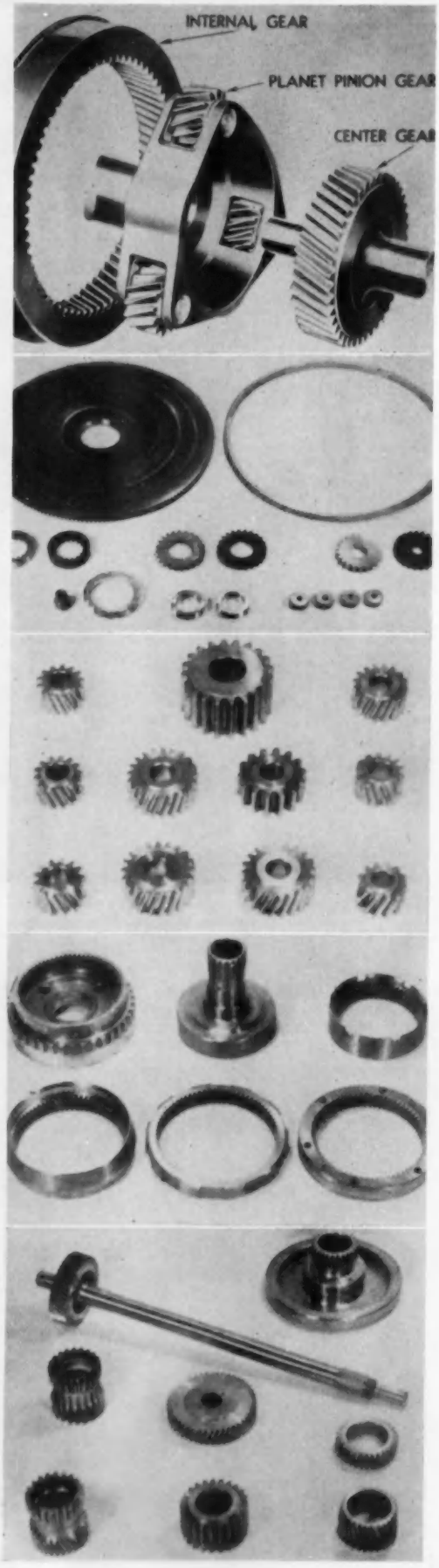


Junction point for sheet metal paint department on upper floor. Sheet metal in white comes in on the conveyor from the lower floor; painted parts return through the same channel.

Wet sanding line for sheet metal. Note that parts come in on carriers transported by the overhead conveyor. Thousands of pounds of paper are consumed monthly. Waste is deposited in the cans seen on both sides of the line.

Sheet metal parts that require color finish are put through the electrostatic paint booth. The automatic spray guns and electrodes are mounted on the right hand side of the booth. In the background is the water wash to catch the small amount of overspray resulting from this process.





METALLURGY of Automatic Transmission Gears

By William G. Mertens
and Frank Zuzich
Detroit Transmission Div.
GENERAL MOTORS

SURVEYING the automatic transmission builders,* it was found that in gearing applications the following gears and gear trains are common to all: (1) Planetary gear systems; (2) Speedo-gears; (3) Pump gears; and (4) Starter ring gears.

The planetary gear system, otherwise known as epicyclic gearing, is used because it is most adaptable to automatic controls and they are truly constant mesh gears. This system is composed of a sun or center gear, planetary pinion gear and an internal ring gear. These gears are usually helical angled, fine pitched with modified pressure angles and leads. The starter ring gear and speedo gears are very similar to those used in manual transmissions. The pump gears, for the internal-external type pump, have helical coarse pitch type gear teeth.

The selection of materials for use in automatic transmissions is generally based on the following factors: (1) physical properties; (2) uniformity of properties; (3) availability of materials; (4) cost; (5) machinability, and (6) equipment to process. Some of these factors are considered more important to some producers of transmissions which results in some difference of opinion as to what type of material to use.

The first type of gears to be reviewed are the planetary pinions. The pinion is the most important member in a planetary gear set, as it is loaded on both sides of its teeth under both drive and coast conditions. The survey of materials, manufacture, process and properties of pinions are shown in the following charts. Basically, as shown in Table 1, planetary pinion gears are made from bar stock either hot rolled or cold rolled, depending on the manufacturer's preference because of equipment or economics. There are

*Buick Motor Car Div., GMC; Chevrolet Div., GMC; Detroit Transmission Div., GMC; Chrysler Corp.; Detroit Gear Div., Borg-Warner; Studebaker-Packard Corp.; Marvel-Schebler Products Div., Borg-Warner.

differences in results of the final product obtained from hot rolled steel versus cold rolled due to the inherent rolled-in stresses, but these differences can be compensated for in the green machining operations. Depending on the type analysis material used, the bar stock is machined either in the "as-rolled" condition or given an annealing treatment for machinability. Subsequent stress-relieving treatments are seldom used except in the case of the SAE 1024 steel. In this instance, a 1250 F stress-relieve treatment reduces the tendency for distortion in heat-treatment.

The various types of materials used have their individual advantages based on the load and wear characteristics for the particular transmission. All the materials must fulfill the composite requirement of tooth strength and wear in conjunction with the ID (bore) wear, because in all planet pinions the ID is a bearing race. The SAE 1024 sulfurized steels offer low cost and good machinability. The SAE 8620 and Amola carburizing grades of steels give uniform hardening results for wear resistance and good fatigue life. The SAE 1330-H and SAE 5140-H and SAE 5145-H offer low cost alloy materials, simple short heat treat operations and very close control of heat treat distortion.

Heat treatments are governed by the material specifications and adjusted to control distortion. Table 2 shows that all planetary pinions are heat processed in continuous type atmosphere furnaces.

The atmosphere consists of an endothermic generator gas with natural gas as an additive when carburizing only. Carbo-nitriding incorporates the same atmosphere but with the addition of ammonia gas. Table 3 gives the final physical properties and shows that the case depths vary from the low case range of .005 in. to .010 in. on the oil hardening medium carbon types of steels to .025 in. to .035 in. range on the carburizing grades of steels. Where the core hardness results in approximately Rockwell C50 range the case

TABLE I

PLANETARY PINION GEARS
SUMMARY OF RAW MATERIAL

Mfr	Type of Material	Form & Condition of Material	Bar Stock Heat Treat	Rough Machining Heat Treat
A	SAE 1330-H	Cold Drawn Bar	Annealed	None
B	AISI-A5145	Hot Rolled Bar	Annealed BHN 179-207	None
C	AISI-4028	Cold Drawn Bar	Cold Drawn	None
D	SAE 8620 SAE 5120	Cold Drawn Bar	Stress Relieve 900 F	None
E	SAE 5140-H SAE 5145-H	Hot Rolled Bar	Annealed BHN 170-207	None
F	SAE 1024	Hot Rolled Bar	Hot Rolled	Stress Relieve 1250 F 1 Hr.
G	SAE 5140-H	Hot Rolled Bar	Annealed BHN 180-207	None

TABLE II

PLANETARY PINION GEARS
HEAT TREATMENT

Mfr	Type of Material	Atmosphere	Quench	Temper
A	SAE 1330-H	Endothermic Gas Carburizing Additive Ammonia Additive	Oil 325 F Agitation	400 F
B	AISI-A5145	Carbo-Nitriding	Oil 140 F Normal Flow	440 F
C	AISI-4028	Endothermic Gas Carburizing Additive	Oil 185 F Agitation	400 F
D	SAE 8620 SAE 5120	Carbo-Nitriding	Oil 120-160 F Mild Agitation	325 F
E	SAE 5140-H	Endothermic Gas Carburizing Additive	Oil 325 F Mild Agitation	375 F 500 F
F	SAE 1024	Endothermic Gas Carburizing Additive Ammonia Additive	Oil 130 F Agitation	350 F
G	SAE 5140-H	Exothermic Gas Carburizing Additive	Oil 180 F No Agitation	375 F

TABLE III

PLANETARY PINION GEARS
FINAL PHYSICAL PROPERTIES

Mfr.	Type of Material	Case Depth (in.)	Case Hardness Rockwell	Core Hardness Rockwell
A	SAE 1330-H	.007-.012	C52-60	C38-46
B	AISI-A5145	.007-.010	A 80 min.	C49-53
C	AISI-4028	.020-.030	C 58 min.	C32-40
D	SAE 8620 SAE 5120	.015-.020	C59-62	C40-45
E	SAE 5140-H SAE 5145-H	.005-.010	C50-56 C56-62 15N 89-91	C50-55
F	SAE 1024	.025-.030	C58-60	C25-40
G	SAE 5140-H	.008-.012	15N 89 min.	C52-56

TABLE IV

CENTER GEARS
SUMMARY OF RAW MATERIALS

Mfr	Type of Material	Form & Condition of Material	Material Heat Treat	Rough Machining Heat Treat
A-1	SAE 1330-H	Cold Drawn Bar	Annealed	None
A-2	SAE 4063	Forging	Cycle Anneal BHN 187-217	None
B	AISI-A5145	Hot Rolled Bar	Annealed	None
C	AISI-4024 Resulphurize	Forging	Cycle Anneal	1700 F 5 Hrs. Air Blast & Box Cool
D	SAE 8620	Forging	Cycle Anneal	None
	SAE 5120	Forging	Cycle Anneal	None
	SAE 8640	Tubing	Annealed	None
E	SAE 5140-H SAE 5145-H	Hot Rolled Bar Hot Rolled Tubing	Annealed BHN 170-207	None None
F	SAE 1024 Resulphurize	Hot Rolled Bar	As Rolled	Stress Relieve 1250 F 1 Hr.
G	SAE 8620	Forging	Cycle Anneal BHN 187 Max.	None

TABLE V

CENTER GEARS
FINAL PHYSICAL PROPERTIES

Mfr	Type of Material	Case Depth (in.)	Case Hardness Rockwell	Core Hardness Rockwell
A-1	SAE 1330-H	.018-.025	C 60 min.	C38-46
A-2	SAE 4063	.005-.010	C 50 min.	C 40 approx.
A-2	SAE 4063	.050-.100	C 60 min.	C 40 approx.
B	AISI-A5145	.007-.010	A 80 min.	C49-53
C	AISI-4024	.020-.030	C 58 min.	C32-38
D	SAE 8620 SAE 5120 SAE 8640	.015-.020 .012-.016	C57-62 15N 89-91 C 60 min.	C25-30
E	SAE 5140-H SAE 5145-H	.005-.010	C50-56 C52-60	C50-56
F	SAE 1024	.025-.030	C56-60	C25-40
G	SAE 8620	.035-.045	C 56 min.	C20-28

TABLE VI

CENTER GEARS
HEAT TREATMENT

Mfr	Type of Material	Atmosphere	Quench	Tamper
A-1	SAE 1330-H	Endothermic Gas	Oil 325 F	325 F
A-2	SAE 4063	Carburizing Additive Ammonia Additive	Agitated	850 F
A-2	SAE 4063	Flame Harden	Oil 140 F	325 F
B	AISI-A5145	Carbo-Nitriding	Oil 140 F Normal Flow	440 F
C	AISI-4024	Endothermic Gas Carburizing Additive	Oil 140 F Die Quench	400 F
D	SAE 8620 SAE 5120	Carbo-Nitriding	Oil 350 F Mild Agitation	325 F
E	SAE 5140-H SAE 5145-H	Endothermic Gas Carburizing Additive	Oil 130 F Oil 300 F Mild Agitation	375 F 500 F
F	SAE 1024	Endothermic Gas Carburizing Additive Ammonia Additive	Oil 130 F Agitated	350 F
G	SAE 8620	Exothermic Gas Carburizing Additive	Oil 375 F Strong Agitation	375 F

TABLE VII

INTERNAL GEARS
SUMMARY OF RAW MATERIALS

Mfr	Type of Material	Form & Condition of Material	Raw Material Heat Treat	Rough Machining Heat Treat
A	SAE 1052	Forging	Cycle Anneal BHN 197-229	Core Treated to Rockwell C23-30
	Alloy Cast Iron	Casting	As Cast BHN 163-229	None
B	Pearlitic Malleable	Casting	As Cast BHN 163-207	None
C	AISI-4028	Forging	Cycle Anneal	Normalize 1700 F 5 Hrs. Air Blast & Box Cool
D	SAE 8620	Forging	Cycle Anneal	None
E	SAE 5145-H	Hot Rolled Tubing	Cycle Anneal	None
F	SAE 120 Alloy Cast Iron (Cylinder)	Shell Mold Casting	Annealed 1250 F BHN 163-217	None
G	SAE 4047 Modified	Forging	Cycle Anneal BHN 207 max.	None

depth is .005 in. to .010 in., while the core hardness results of approximately Rockwell C30-40 have case depths of .020 in. to .035 in. The surface hardness is maintained at approximately Rockwell C58 for wear resistance properties.

Sun or center gears are usually intermediate in amount of load factor in the planetary gear system, but in some instances can be the heaviest loaded member. The center gears are also critical factors with respect to contribution of noise in the transmission.

Center gears, as shown in Tables 4, 5 and 6 are similar to the planetary pinions in most respects. As can be seen, the form of raw material is varied in that hot rolled and cold drawn bar stock, tubing stock and forgings are utilized. The choice of material varies, because the gear is quite often designed integral with some component such as a shaft, flange, clutch race or other engineering principles. It is the so-called "additions" to the center gear that complicates the material choice and subsequent machining and heat treatment.

The data as tabulated in Table 4 show that the material form and its heat treatments vary according to the material choice and are duplications of the planetary pinion gear materials. Two items in the table show the use of forgings (Items A & G), this choice, as stated before, is predicated by the engineering design and cost.

Surveying the final physical properties, Table 5, again it is noted that there is great similarity to the planetary pinion gears. The surface hardness is maintained at approximately Rockwell C58, in both the carburizing grade steels and the medium carbon steels. Case depths range from .005 in.-.010 in. to .035 in.-.045 in., again dependent on the material grade.

An excellent illustration of an engineering combination of a gear design integral with another engineering principle is the case of a center gear and roller clutch race combination. (Item A-2.)

TABLE VIII

INTERNAL GEARS
FINAL PHYSICAL PROPERTIES

Mfr	Type of Material	Case Depth (in.)	Case Hardness	Core Hardness
A	SAE 1052	Flame Harden Gear Teeth	Rock C52-60	Rock C23-30
	Alloy Cast Iron	None	BHN 163-229	BHN 163-229
B	Pearlitic Malleable Iron	None	BHN 163-207	BHN 163-207
C	AISI-4028	.020-.030	Rock C 58 min.	Rock C32-38
D	SAE 8620	.015-.020	Rock C57-62 Rock 15N 89-91	Rock C25-30
E	SAE 5140-H	.005-.010	Rock C50-56	Rock C48-55
F	SAE 120 Alloy Cast Iron	None	BHN 163-217	BHN 163-217
G	SAE 4047 Modified	.008-.012	Rock 15N 89 min.	Rock C52-55

This part presented many problems when it was processed. The gear teeth required wear resistance and strength, the race area required a very high surface hardness, yet the entire part could not be hardened through to the high surface hardness of Rockwell C60 required for the race. Full hardening resulted in low fatigue life on preliminary engineering tests. Therefore, the part is heat treated with a modified carbo-nitriding method to a case depth of .010, using small amounts of ammonia gas and then hot oil quenched at 325 F. This treatment will allow the case to resist the high 825 F tempering temperature and leave the gear teeth wear resistant, yet giving a softer core hardness, resulting in ductility and strength on the outside diameter of the race area. The inside diameter of the race is flame-hardened to a case depth of .050 in.-.100 in. to provide the hard surface hardness required for the roller clutch. The final temper is 325 F. Physical properties are as follows:

Core = Rockwell C40.
Case = Rockwell C50 minimum on gear teeth.
Race Area = Rockwell C60 minimum on surface.
Race Area = Rockwell C59 minimum at .050 in.-.100 in. hardened depth.

Heat treatments of the center gears as shown in Table 6 are accomplished in continuous type atmosphere furnaces using carburizing or carbo-nitriding atmospheres. All manufacturers utilized free quenches in both normal temperatures and hot oil quenches, except for one. The case in exception is an integral design center gear and flange, which is die quenched for distortion control.

The internal gears, generally, are the least loaded of all the gears in a planetary gear system. The three tables covering the survey on these parts represent a wide variety of materials and physical property requirements.

Table 7 shows not only the usage of low and medium grade carbon alloys, as seen in the previous gear types, but also the application of plain carbon steels, alloy cast irons and pearlitic malleable iron. In those applications, where the physical requirements are low, the economics of lowest cost and most freely machinable types of materials are specified. The material form is variable, ranging from tubing, casting, forgings and shell mold castings.

It is readily seen, as shown in Table 8, that the heat-treated internal gears correspond closely to the planetary pinion gears. The cast iron and pearlistic malleable iron gears are specified to approximately a 200 Brinell Hardness Number in the cast form, and require no heat-treatment in the final machined product.

Table 9 shows the same heat-treatment methods as previously listed and discussed on both the center and planetary pinion gears. The internal gears require more attention for die or fixture quenching to control and minimize distortion. The physical size of the parts with the relatively thin wall sections, inherently creates the ever-present distortion problem.

The SAE 1052 internal gear has the teeth flame hardened to the required hardness for wear resistance. This gives a combination of low-cost material, high production heat treat method with reduced gear tooth distortion problems.

The gears manufactured from castings require no final heat treatment and present accurate gear tooth contact conditions in the transmission, because of the accuracy of the "as machined" condition.

The summary of the flywheel ring gears, Table 10, shows the use of medium plain carbon, oil hardening steels. Since the ring is made of bar stock butt welded, the normalize stress relieve and anneal operations are required to relieve the stresses due to welding. Flame hardening is used in all cases but one for the heat treating operations, with the final hardness of Rockwell C38-52 being the full range used.

TABLE IX

INTERNAL GEARS
HEAT TREATMENT

Mfr	Type of Material	Atmosphere	Quench	Temper
A	SAE 1052	Flame Harden Teeth Only	Oil 130 F Agitated	325 F
	Alloy Cast Iron	None	None	None
B	Pearlitic Malleable	None	None	None
C	AISI-4028	Endothermic Gas Carburizing Additive	Oil 150 F Die Quench	400 F
D	SAE 8620	Carbo-Nitriding	Oil 350 F Fixture Quench	325 F
E	SAE 5140-H	Endothermic Gas Carburizing Additive	Oil 140 F Die Quench	450 F 550 F
F	SAE 120 Alloy Cast Iron	None	None	None
G	SAE 4047 Modified	Carbo-Nitriding	Oil 180 F No Agitation	375 F

Pump gears do not carry the heavy loads required of the planetary gears and this is reflected in the materials used. Table 11 shows the predominant use of free machining type steels and alloy cast irons. The important factor in pump gears is accuracy of tooth forms, machinability and surface finish. It should be noted that some manufacturers use chemical surface treatments such as phosphate coatings for "break-in" or prevention of galling of critical contact surfaces.

Speedo gears are very similar to those used in the manual shifting transmissions and the materials used are basically the same. Table 12 shows the use of free machining steels with or without a heat treatment and also the use of non-metallics, such as nylon. Under proper applications, nylon will produce a durable speedo gear with the advantages of low weight, low cost and quiet operation.

(Continued on next page)

TABLE X

SUMMARY OF STARTER OR FLYWHEEL RING GEARS

Mfr	Type of Material	Form of Material	Treatment Prior to Machining	Heat Treat Method	Quench	Temper	Hardness Rockwell
A	SAE 1045	Hot Rolled Bar	Normalize 1575 F	Flame Harden Teeth Only	Agitated Oil at 140 F	Induction Temper 525 F	C48-52
B	AISI-1050 Modified	Cold Drawn or Hot Rolled Bar	Anneal 1400 F— 8 Hrs.	Continuous Furnace Exothermic Atmosphere Gas	Oil at 110 F	790 F	C 38 Minimum
C	AISI-C1045	Hot Rolled Bar	Normalize	Flame Harden	Oil—No Agitation	600 F	C46-52
D	AISI-C1053	—	—	Flame Harden	—	—	C48-52
	SAE 1042	—	—	Induction Harden	—	—	—
E	SAE 1045	Cold Drawn or Hot Rolled Bar	Stress Relieved at 1600 F	Flame Harden	Agitated Oil at 120 F	500 F	C45-50
F	SAE 1050	Hot Rolled Bar	Annealed at 1400 F— 2 Hrs.	Flame Harden	Oil—Room Temperature No Agitation	None	C 50 Minimum

TABLE XI

SUMMARY OF PUMP GEARS

Mfr	Type of Material	Form of Material	Treatment Prior to Machining	Heat-Treat Quench-Temper Hardness	Surface Treatment
A	SAE 1045 SAE 1112	C. O. Tubing C. O. Bar	Annealed As drawn	Stress Relieve 1100 F None	Phosphate Coating
B	AISI-C1117 C1125	C. O. Bar or Tubing	Tubing Stress Relieved at 900 F	None	Phosphate Coating
C	Cast Iron B-1112 C-1118	Casting C. O. Bar C. O. Tubing	As Cast None Stress Relieve at 1000 F	BHN 187-228 None Carbonitrided .010 – .020 Cast Oil – Temper 500 F RC42-47	Phosphate Coating None Shot-Blast
D	SAE 1118	Tubing	Stress Relieve at 900 F	Carbonitrided to .010 in – .015 in. Case Oil Quench-Temper at 325 F R 15N 88-90	Phosphate Coating
	Stress Proof Alloy Cast Iron	Bar Casting	None None	None BHN 230-280	Phosphate Coating None
E	SAE 1113	Cold Drawn Bar	As Drawn	None	Phosphate Coating
F	Alloy Cast Iron	Casting	Stress Relieve 800 F	BHN 207-255	None

TABLE XII

SUMMARY OF SPEEDO-GEARS

Mfr	Type of Material	Form of Material	Treatment Prior to Machining	Heat-Treat	Quench	Hardness	Remarks
A	Leaded Steel	Cold Drawn Car Stock	As Drawn	Carbonitrided to .007 in. – .012 in. Case Depth	Oil at 325 F	File Hard	Grit-Blasted Surface
B	AISI-C1117	Bar or Tubing Stock	As Rolled	None	—	None	None
	Nylon	Injection Molded	—	—	—	—	Molded as a Finished Part
C	Non-Metallic	—	—	—	—	—	—
D	SAE 1113	Bar Stock	As Rolled	Carbonitrided to .010 in. – .015 in. Case Depth	Oil	File Hard	None
E	SAE 1113	Cold Drawn Bar Stock	None	Carbonitrided to .007 in. Case Depth	Oil at 140 F	File Hard	None
	SAE 1118	Cold Drawn Tubing Stock	As Drawn	Carburized to .005 in. – .010 in. Case Depth	Oil at 300 F	File Hard	None
F	Nylon	Injection Molded	—	—	—	—	Molded as a Finished Part

Future Developments

Future progress in the production of gearing will be a cooperative effort between the design engineers, metallurgists, production engineers and raw material producers. The continued drive for more automatic manufacturing processes will force simplification in design, further application of freer machining types of materials, closer control of the raw material and development of new manufacturing methods.

Engineering designs are subject to close review from the standpoint of converting or simplifying the component parts. The design of gearing into symmetrical forms permits the use of bar stock and tubing raw materials, which simplify handling, machining and tooling. However, redesign along this course presents other problems such as the assembly of the elements. Developments of assembly methods, such as press-fits, staking, shrink fits or welding, can produce quality assemblies which can then be substituted for the complex, costly one piece forgings and castings.

Improvements in machinability must be obtained in order to permit extended production runs and more uniform cycle times, with less tool changes to properly and economically utilize the concept of integrated manufacturing. Further investigations of resulphurized steels and leaded steels should aid and abet the machinability problems.

Future developments to more closely control the range of hardenability for a given material is a must. It is the experience of all manufacturers that the present wide spread in hardenability can upset all phases of manufacturing because of the size change variations obtained in the heat treat operations. Further development work should be done to improve the annealing and normalizing of raw material forms at the prime producers, such as steel mills. The wide variations in hardness and micro-structure

(*Turn to page* 102, *please*)

129th National Meeting *of the* American Chemical Society

Speakers Predict Water-Based Paints, Rubber Air Spring Suspension, and Increased Use of Plastics, Aluminum, Magnesium

DALLAS, TEXAS

INTERDEPENDENCE of the automotive industries and chemical industries and the impact of the automotive industries on the chemical economy were convincingly demonstrated in the course of a two-day symposium at the national meeting of the American Chemical Society in Dallas last month.

Practically every speaker had something to say that concerned the automotive industries. One of the rubber specialists, for example, gave as his opinion that rubber air spring suspension may find its way into at least one make of car in 1957; and he felt that a number of makes would feature air springs on 1958 models. Another specialist speculated on the possibility of making car bumpers of rubber colored to suit the paint scheme of the car.

Special Finishes

Talk around Detroit recently was concerned with a special type of outobody paint that does not require oven drying. At the meeting we learned that a "multi-color" water-based paint is being used on the west coast for custom painting certain sport cars. It is air-drying and may be related to the talk around town. One of the paint experts predicted that water-based finishes may be commercially employed in five years. Another development is acrylic lacquer which may be in use within a couple of years. This is the finish that has extremely high gloss and does not require frequent polishing in service.

Then there is the possibility somewhere in the dim future of light-storing pigments in auto finishes. These pigments will store light energy during the day, release it at night sufficiently to identify the car.

Huge Paint Consumption

Distinctive feature of the papers was that each one represented a survey of current use with projections into the future, thus providing valuable market data. Newell P. Beckwith of Rinshed-Mason stated that 55-million gallons of paints were consumed in the automotive industries in 1955. Generally about 7.4 gal. were used per car for lacquer finish; about 5.66 gal. per car for synthetic enamels.

R. C. Grills of duPont described the amazing increase in use of synthetic fibers for motor cars, a trend that began only in 1950. Metallic yarns for upholstery, costing about half the price of older wool fabrics, predominate in 1956 models. He expected the industry to consume about 19-million pounds of metallic yarns during the year. Filament orlon yarn is on the way for the near future. If the price can be brought down sufficiently, Grills predicts that motor car producers would shift to fiberglass for all thermal and sound insulation.

Increased Aluminum Use

Chrysler's F. H. Mason estimtaed that his company would consume as much as 100-million pounds of aluminum, mostly in die-cast form, in '56. Chrysler studies have indicated that aluminum, if properly selected as to applications, will compete very favorably with the commonly used materials. The increasing use of aluminum for decorative purpcses and the use of anodized color finishes will reduce the need for electroplated chromium finishes quite materially. Incidentally, the increased use of aluminum is reflected in a corresponding drop in the consumption of zinc alloys.

Mason felt that magnesium should be just as adaptable in automotive applications as is aluminum. The fact that it is not as widely used in motor cars is due to lack of exploitation, in his opinion.

In 1956 Chrysler cars are using about 70 lb of aluminum per car.

Plastics Applications

William C. Wall of duPont went into the history of plastics applications since their early beginnings, described current applications in detail. Although there are a great many plastic parts in every motor car, usage in 1956 amounts to but 10 lb per car on the average. This establishes a goal for plastics producers—to increase usage as time goes on.

Taking into account the improvements in techniques and formulations that should be emerging in the near future, Wall visualized as practicalities the molding of one-piece plastic trunk lids and hoods. He also envisaged the molding of seat frames and perhaps even a complete seat assembly fully upholstered and ready for installation in a car.

Trends in Liquid Fuels

Discussing future trends in liquid fuels, W. J. Sweeney of Esso saw in less than 10 years fuels of 101 octane rating for engines having 11.0 to 1 compression ratio. As compression ratios increase, the

(*Turn to page* 102, *please*)

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION — VEHICLES — AIRCRAFT

By Samuel Cummings

ADVANTAGES OF AUTOMATION

Automation will not cause mass unemployment; instead it will create new jobs and industries, help raise the standard of living and lower prices, Gwilym A. Price, chairman and president of Westinghouse Electric Corp., declared in a talk at the Edison Electric Institute sales meeting in Chicago.

Furthermore, we have no choice in the matter, he told his audience. "If Russia automates faster and better than we do, the result will be fatal. We are engaged in a struggle with that nation in which, for us, second place means extinction as a free nation."

Fears of mass displacement of workers resulting from too rapid automation are not well-founded, according to John J. Staab, of General Electric Co. He spoke at the annual Industrial Relations-Production Conference of the Greater Philadelphia Chamber of Commerce.

Automation is an expensive process, he pointed out, and industry will go slow until it is convinced that it will be more profitable in the long run to automate than not to do so. As an example, he cited automobile engine plants, which are highly automated today. Staab maintained that it is technically possible to completely automate these plants; but, he went on to say, "no manufacturer will go this far now because of the radically different engines now being tested, such as the gas turbine and free piston types, which threaten to replace today's internal combustion engine before the investment in a completely automatic factory could be amortized."

AUTOMATION LITERATURE

Two recently published books should make absorbing reading for anyone considering the idea of automating. "Applied Automation," edited by James Custer and published by Chilton Co. (price: $6.00) contains over 100 articles that originally appeared in AUTOMOTIVE INDUSTRIES, covering specific applications in the automotive industries.

"A Survey of Domestic Electronic Digital Computing Systems," by Martin H. Weik, was released through the Office of Technical Services, U. S. Dept. of Commerce (price: $4.75). Based on an Army survey of 84 electronic computer systems, the book answers such questions as: What can the various electronic computers do? How can they be used in business? What type of computer is best in a given situation?

AUTOMATIC CHUCK CONTROL

Automatic control of magnetic chucks has been developed by the DoALL Co. The DoALL Selectron permits work and chuck to be demagnetized in an average time of from five to ten seconds. In addition, the Selectron releases chips produced by machining. Holding strength can be varied from minimum to maximum magnetic power; and, once the Selectron is set, successive grinding operations can be repeated indefinitely without further adjustments.

COMPUTER: NEW OPERATING DATA

A machinability computer introduced recently by Carboloy Dept. of General Electric Co. can now be used to solve milling as well as forming, grooving, and similar plunge-cut machining problems.

New operating data developed by Carboloy engineers have made possible the extension of the use of this computer. The data, which are incorporated in a revised manual that accompanies every computer, show how tool life settings can be adjusted to obtain the milling information desired—in spite of the fact that each cutter dwells in the cut only a fraction of the cutter revolution.

A tool engineer, using the new data, now can easily solve problems, it is claimed, involving face, slab, straight and staggered-tooth slotting, and straddle milling to establish correct depths of cuts, feeds and speeds.

A simple formula worked out for forming, grooving and similar plunge-type tools enables a user to employ the standard computer settings to work out problems involving width and depth of cuts as well as other factors.

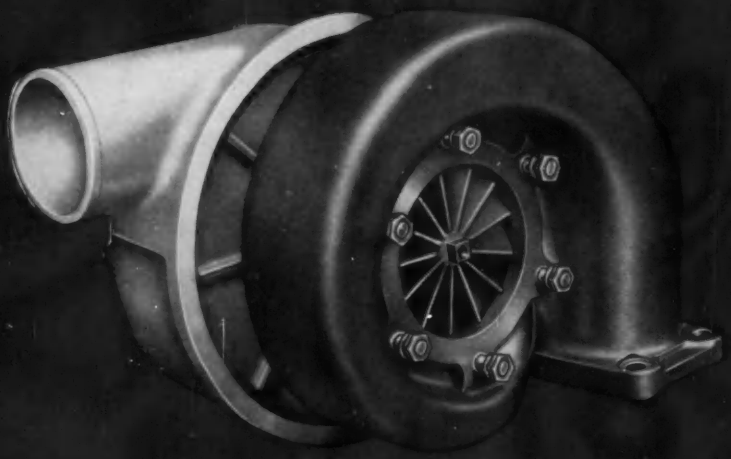
FLOW-RATIO CONTROL

A flow-ratio control system that holds the ratio of two liquid flows with an accuracy of 0.5 per cent has been designed for the process industries by Leeds & Northrop. Separate meters on both process lines are connected to separate recorders. Each meter converts fluid flow into shaft rotation; the shaft in turn is geared to a tachometer generator. Parallel electrical leads from the two tachometer generators are connected into the bridge circuit of a controller, which also incorporates proportional, reset and rate time type of pneumatic control. When the flow varies from the desired process ratio, the controller positions a diaphragm motor valve on the smaller reagent flow line.

Flow ratios can be adjusted from a remotely located panelboard. In addition, the panelboard provides permanent chart records of both flow rates and the controlled ratio, as well as a flow totalizer which indicates the main stream flow in digital figures. A switch, incorporated in the totalizer, diverts the mixed liquids to successive process vessels after a preset quantity has been metered out to one process vessel.

SCHWITZER

TURBOCHARGERS



"ORBIT-SEEKING," "INSTANT-ACTION" WHEELS

These and other features exclusive in Schwitzer Turbochargers, account for proven installed performance and durability.

"Orbit Seeking" Wheels, as pioneered in Schwitzer Turbochargers, are now being featured in the Turbine Engine Industry.

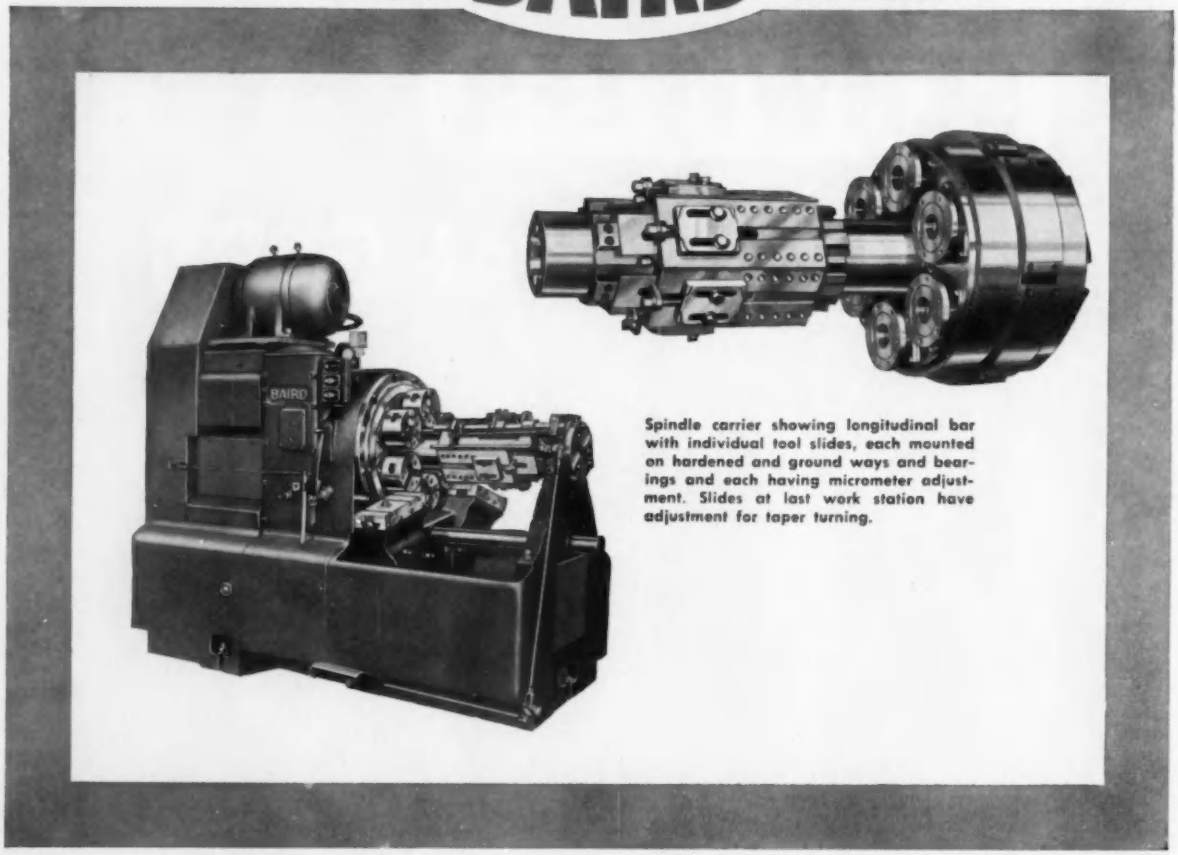
"Instant Action" wheels assure rapid compressor acceleration for the best installed engine performance.

As your supplier, Schwitzer assures you of the most advanced design and economy in the field of fluid flow and vibration damping products.

SCHWITZER CORPORATION

INDIANAPOLIS, INDIANA

...ask BAIRD about it



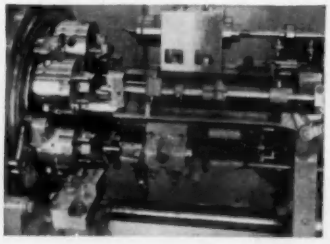
Spindle carrier showing longitudinal bar with individual tool slides, each mounted on hardened and ground ways and bearings and each having micrometer adjustment. Slides at last work station have adjustment for taper turning.

Why the preference for BAIRD Chuckers?

Aside from the fact that the Baird 76-H Chucker has enough outstanding design features and advantages to fill a 12-page brochure (which we will be glad to send you on request), there are two main reasons for its popularity.

One is the unique versatility in tooling provided by an essentially simple, "clean" design which at the same time permits exceptional scope in variety and sequence of operations and cycles . . . including complete automation.

The other is the manner in which Baird Engineering tackles an *individual* customer's problem. Here you get the benefit of our years of work with the nation's top high-production specialists . . . a staff of chucker experts, backed by exceptional tooling and test facilities. When a Baird Chucker reaches the production line, promised performance can be achieved . . . and manitained.



An example of versatile Baird 76-H Chucker tooling for finishing a die cast aluminum end plate, single-indexing, including recessing tool for back-facing . . . high speed boring heads, two-spindle lead screw tapping attachment. Production: 420 pieces per hour.

Our case history files almost certainly contain the start of a profitable answer to YOUR problem in high-speed repetitive production. Before you decide on methods or machines, it will pay you to "Ask Baird About It." Write Dept. A1.

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

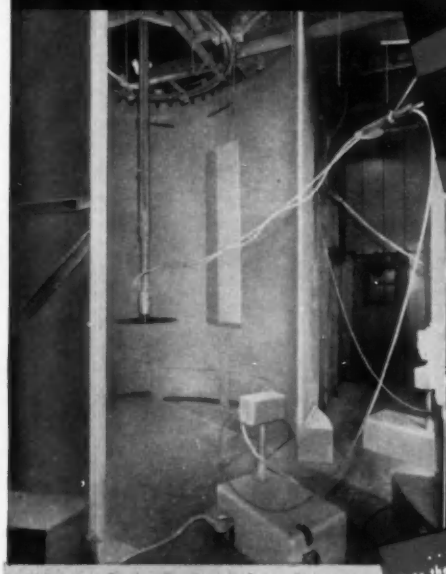
THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

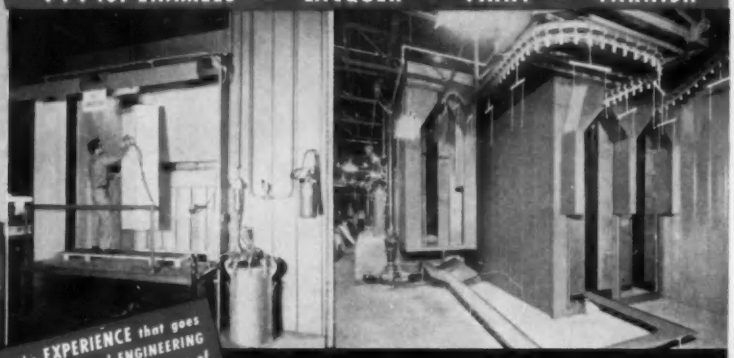
3BA56

COMPLETE *Finishing* SYSTEMS

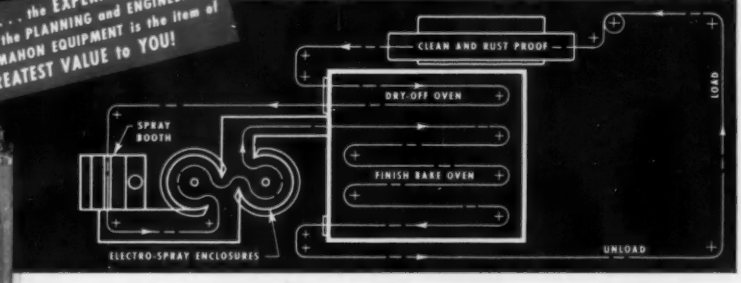
. . . for ENAMELS • LACQUER • PAINT • VARNISH

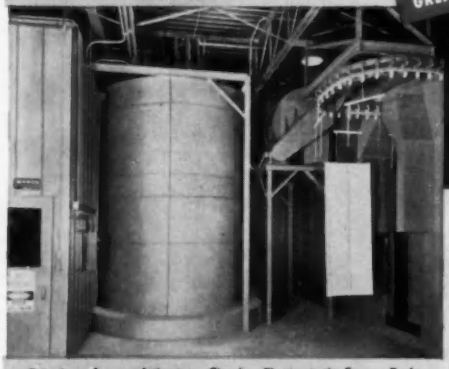


Ventilated, Circular Electrostatic Spray Enclosure. Disc Applicator travels up and down. Air is exhausted through adjustable openings around the bottom.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!





Exterior of one of the two Circular Electrostatic Spray Enclosures. Air Exhaust Duct is continuous around the bottom.

Exit end of Finish Baking Oven. In this installation the Dry-Off Oven and Finish Baking Oven are combined in one unit.

Compact MAHON SYSTEM Finishes 2000 "SLIMFOLD" Metal Closet Doors Per Day!

The finishing equipment shown here is a Complete Mahon Finishing System designed especially to do a particular job for Ternes Steel Company, Detroit. It includes facilities for cleaning, rust proofing, drying, spray painting, electrostatic coating and finish baking on both sliding and folding metal closet doors. This is a typical example of Mahon's service to industry. No matter what your finishing requirement may be, it will pay you to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you will find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment, which is the key to fine finishes at minimum cost. And, if you care to investigate, you will find that Mahon equipment will serve you better . . . because Mahon equipment is engineered better and built better for more economical operation over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File for further information, or write for Catalog A-656. Better still, why not have a Mahon engineer call at your convenience.

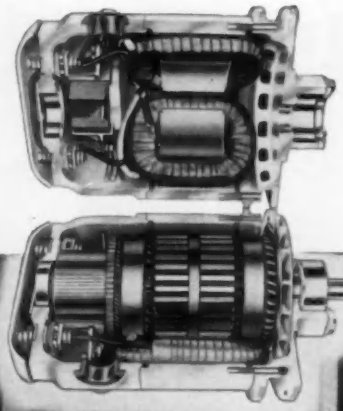
THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

HEART OF EVERY AUTOMATIC ELECTRIC TRUCK
is a motor designed and built solely for the demanding requirements of materials handling. Hairline precision throughout insures highest efficiency—lowest operating cost. Automatic is the only industrial truck manufacturer making its own class-H silicone wound motors. Immune to overload failures and burnouts even at 300° to 400° F, they are standard on all heavy duty Automatics.



In Materials Handling Follow The Leaders... Use Automatic Electric Trucks

Tires to delight the heart of Paul Bunyan! Custom-built for Gargantuan earth movers by a famous rubber company, these monsters present a threefold materials handling problem; awkward shape, mammoth size and a weight of approximately 2600 lbs. each. But they're no challenge to the Automatic Electric Skylift seen above. It handles them with ease, operating 24 hours a day, 365 days a year if the need arises.

Like all Automatic Electrics in plants the country over, the one above and others in the same plant are prime favorites of their operators. You can't beat 'em, they say, for easy inching and maneuvering, especially in close quarters—for safer low center of gravity—for the extra comfort of smooth, vibrationless, fume-free rides with no gears to shift.

These same qualities, plus an enviable record of economy, efficiency, minimum down time and lowest cost per year of ownership have won equally high favor from management wherever Automatic Electric Trucks are used. But that's only part of the story...

Write today for Automatic's brand new 16-page catalog of America's most complete line of Electric-Driven Industrial Trucks—capacities 1,000 to 100,000 lbs. Address: Automatic—57 West 87th Street—Dept. E-6—Chicago 20, Illinois.

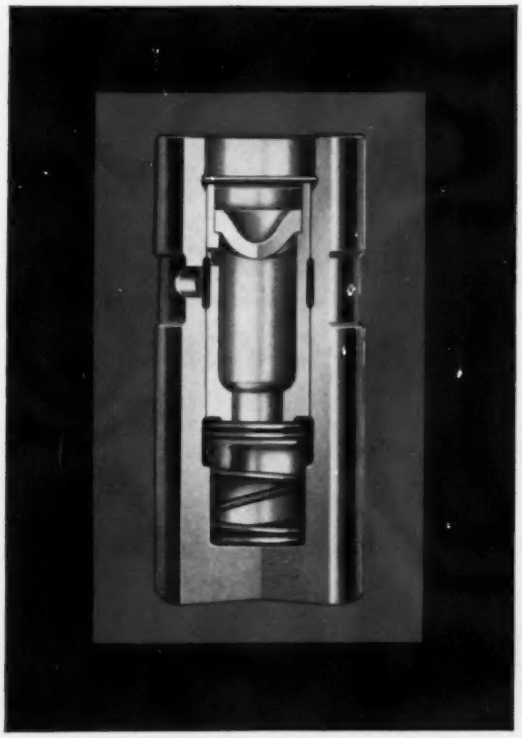
50th Automatic Anniversary

WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS

EATON

Zero-Lash®

VALVE LIFTERS



What they do:

Eliminate lash maintenance for the life of the engine

Eliminate valve breakage and valve burning

Provide quiet valve train operation

★

How they do it:

Control valve seating; prevent valve pounding

Maintain zero valve clearance under all operating conditions

Provide accurate valve timing

Eaton Hydraulic Valve Lifters are custom-engineered in a wide range of materials which provide maximum durability. Our engineers will be glad to discuss the application of Eaton Hydraulic Valve Lifters with original equipment manufacturers.

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SAGINAW DIVISION
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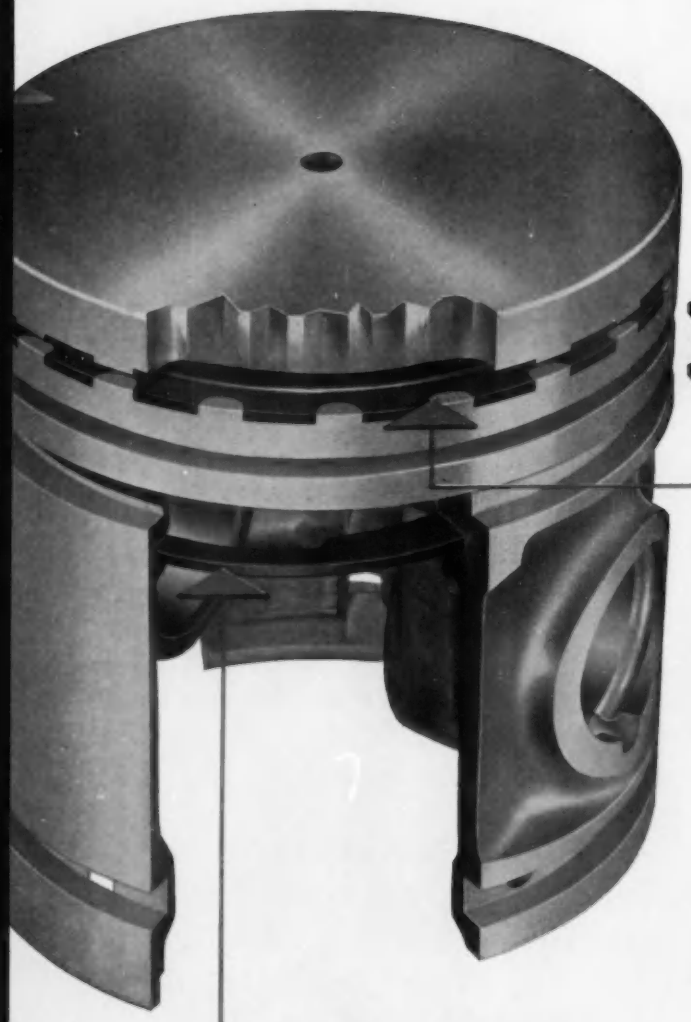
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

NOW! STERLING CONFORMATIC PISTONS



CONFORMATIC STEEL CONTROL MEMBER, anchored at the pin bosses only, controls skirt clearance . . . hot or cold! The metered steel insert allows you to specify the piston clearance *you* want for your engine. (Clearances from zero to ½ thousandth inch are generally recommended.)

are available with LOW COST Intra-Cast* STEEL-LINED GROOVES

***Steel protection—top and bottom*—gives sensationally longer life to rings and grooves.**

This ring is *integrally cast* into the piston . . . positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

** Tradename Registered*

STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MISSOURI

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Special Tool - Leasing Plan, Placed on Standby Basis, Makes Government Machine Tools Available to Industry for Emergency Operation in Major Disaster Areas

Tool Leasing On Stand-By Basis

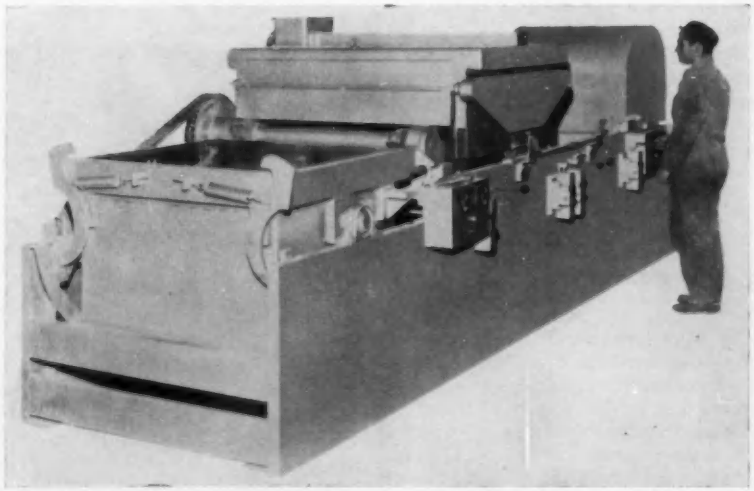
Machine tools and related equipment owned by the Government will be made available to industry for emergency operation in the future under a plan used last year to aid firms in the flood-damaged Northeast.

Standby status is given the special tool-leasing plan in a new Office of Defense Mobilization action. ODM says the plan will be put to work again whenever the Federal Civil Defense Administration decides that a major disaster has occurred.

Equipment in the Government inventory which industry would find useful includes machine tools, secondary metalworking machinery, and industrial trucks and tractors. These items are to be made available for lease to companies which have had equipment damaged or destroyed in floods and similar disasters.

As in the case of tools leased to firms in the northeast, where the plan is terminated now by ODM, this equipment eventually reverts to Government inventory.

These special Snyder vertical trunnion type machine tools for machining automotive axle housings are being assembled in a portion of the newly expanded assembly area at the Snyder plant in Detroit.



This world's largest shell molding machine is made by Shallway Corp. and has been installed in the steel foundry of the National Tube Div. of U. S. Steel Corp. The two-station unit will produce steel castings up to 34 in. square. The machine produces 70 shells an hour. It will be used for production of steel piercing dies.

Around the Industry

Davis Boring Tool Div. of Giddings & Lewis has acquired the inventory fixtures and engineering data of Kelly Reamer Co. Operations will be centralized at Fond du Lac, Wis., in the Davis plant. The Kelly name will be retained.

Monarch Machine Tool Co. has reported that business is still being received in volume due to interest generated at the Machine Tool Show. Jerome A. Raterman, president of Monarch, stated that the company's backlog is substantially larger than any which it has had, except for a war year. He predicts that 1956 shipments will be double those of any previous peacetime year.

Snyder Tool & Engineering Co. has completed its $600,000 plant expansion. A million-dollar shipment of machine tools assembled in the new plant has already been delivered.

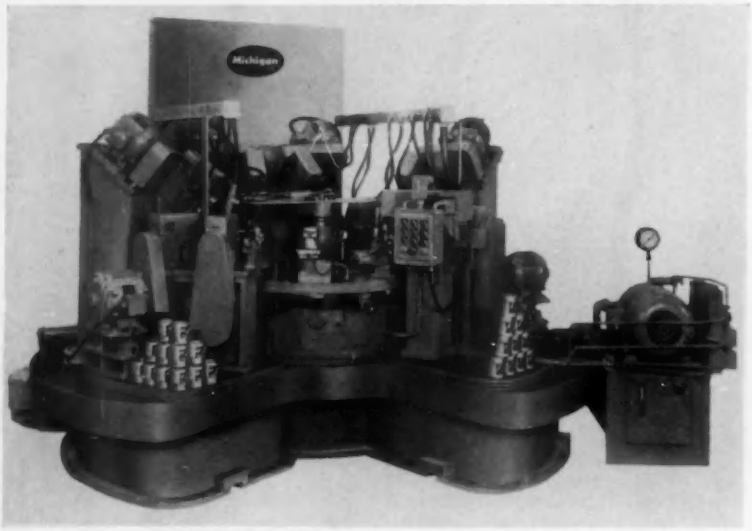
E. W. Bliss Co. has purchased controlling interest in Matteson Equipment Co., Inc. Matteson, which will

(*Turn to page 136, please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Drilling Machine Handles 1200 Pistons Per Hour



Michigan Drill Head machine does 10 separate operations on pistons

AN eight-station, horizontal and angular, dial-type drilling machine that finish drills 1200 pistons per hour, has been unveiled. During each complete cycle of the machine it performs 10 separate operations on each piston—finish drills 4 angular holes and finish drills 6 horizontal smoke holes.

Featured are an automatic hydraulic index table and individual automatic indexing fixtures. Attached to the 42-in. index table is a mounting plate, 60-in. diam, for facilitating the mounting of the indexing fixtures. These fixtures are said to make it possible to drill both the angular holes, as well as the horizontal smoke holes, on the one machine. The completed pistons are ejected automatically at the eighth station.

Hydraulic power clamping of fixtures and fully automatic clamping and cycle control, from station to station, in addition to automatic lubrication, are provided. *Michigan Drill Head Co.*

Circle 30 on postcard for more data

Bar and Tubing Unloader

DIFFERING from the usual type of bar unloader made by the company, a recently-introduced unit unloads pieces of bar or tubing from a production machine to a high tote box. The unloader has one stationary tower and one movable elevator so that it can be adjusted to handle pieces from 3 to 12 ft in length and from 1½ to 3-in. in diam, at a variable rate of speed.

In operation, the bar or tubing flows from the production machine into a vee-shaped trough which is tripped to one side as the piece leaves the machine. The piece falls down an incline until it is picked up by the cleats of the two elevating conveyors, which operate in unison. It is then lifted to the top of the conveyors and over to the other side of the unloading machine, where it rolls into the tote box. *Feedall, Inc.*

Circle 31 on postcard for more data

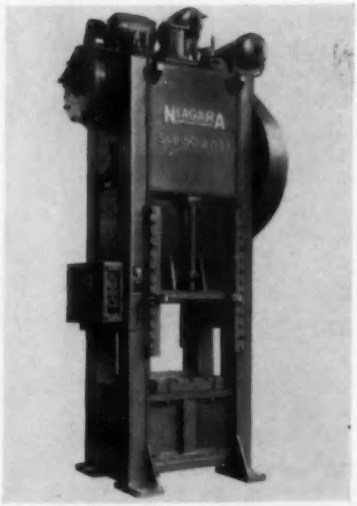
Single Crank Presses

SINGLE crank straight side presses, in a new line, feature enclosed construction, front and back, concealing the driving mechanism. There is no overhanging flywheel, clutch, brake, intermediate shaft or motor in the rear of the press.

Greater accuracy and longer die life are said to be obtained by the all-steel one-piece frames of box section design, which provide resistance to deflection from horizontal, diagonal and torsional stresses. Box type welded steel slides are power adjusted through self-locking barrel type connections to accommodate a range of die heights and facilitate die setting. The shut height and slide adjustment permit the use of a variety of stamping and forming dies. The units are equipped with electro - pneumatic clutch controls.

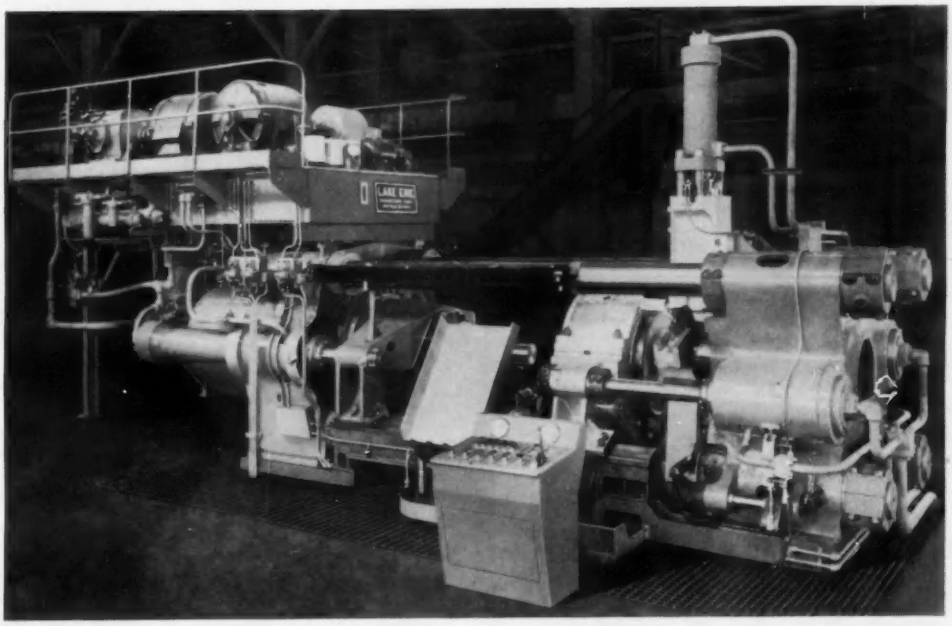
They are available in capacities of 100 to 400 tons and can be furnished optionally with automatic lubrication, pneumatic die cushions, automatic feeds, variable speed drives, knockout bars and other features to meet individual needs. *Niagara Machine & Tool Works.*

Circle 32 on postcard for more data



Niagara single crank straight side press

2300-Ton Hydraulic Aluminum Extrusion Press



The first of a series of 2300-ton aluminum extrusion presses, this machine is capable of extruding billets from six to nine-in. diam and up to 30-in. length, as well as rectangular billets, of speeds up to 48 ipm. Fast approach speeds of 825 and 760 ipm respectively permit a non-extrusion time of less than 20 sec. Controls are interlocked and semi-automatic operation is provided for either flat or bridge type dies. (Lake Erie Engineering Corp.)

Circle 33 on postcard for more data

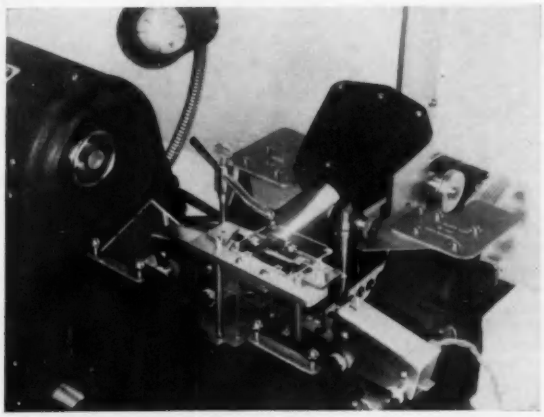
Balancer for Small, High-Speed Parts

For balancing miniature rotors and small rotating assemblies, the "AA" Modified Balancer, which is an adaptation of the Model S Dynograph Balancer, is now being offered. Rotors weighing a fraction of an ounce can be balanced on a production basis, it is reported. The light weight of the vibrating head assembly is said to promote high relative sensitivity to very small moments of unbalance, and to allow balancing to be done at high speeds (10,000 to 15,000 rpm) when desirable.

An axially disposed, revolvable light beam scanning arrangement is used wherever the work is sufficiently large in diameter to allow a radial phasing mark to be placed on one end, or where a projecting shaft allows a scanning target to be readily attached. The amount and position of unbalance are shown by a linear trace on the 0-50 vertical cathode ray tube scale.

When balancing very small diameter rotors, without the benefit of shaft extension, a fixed light beam peripheral scanner is available. This scans a single reference mark on the periphery of the work, instead of on the end area. With the fixed position scanner, the amplified unbalance signal is passed through a "phase splitting network" and the unbalance trace appears as a circle on the cathode ray tube scale, the diameter of the circle being proportional to the amount of unbalance. The angular location of the unbalance is shown by the position of a "pip" on the circular trace. The special amplifier can be converted from linear to circular trace indication, and vice versa, by throwing a switch. *R. B. Annis Co.*

Circle 34 on postcard for more data



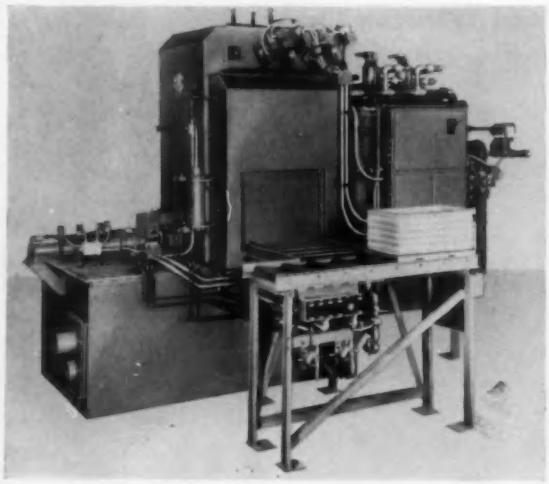
Annis "AA" fixture with peripheral scanner for balancing miniature parts which rotate at high speed

Electronic Micrometer

With a new electronic micrometer, up to 3500 pieces per hour at tolerances less than 0.0001-in. can be checked, according to an announcement. Called the 'Minitron,' it features two sets of adjustable anvils for accepting a production run for checking without "feel." This permits the gauge stand to be pre-set and locked to conform to a master. The pieces are inserted and the position of the indicator noted. Diameter, concentricity and taper are quickly found.

The instrument has an electronic adjustment which permits the establishment of any magnification desired from 10,000/1 to 1000/1. When adjusted for largest magnification, 0.0001-in. appears over one full inch. There is said to be no flicker, flutter, or drift of the gauging indicator. *EAM Div., Industrial Gauges Corp.*

Circle 35 on postcard for more data



The DOWmatic HC-800 batch-type furnace has a gross heating rate of 800 lb per hour, temperature range of 1450 to 1700 deg F, and an oil quenching system (70 to 190 deg F) for carburizing, carbonitriding, carbon restoration and clean hardening.

Batch-Type Furnace is Automated

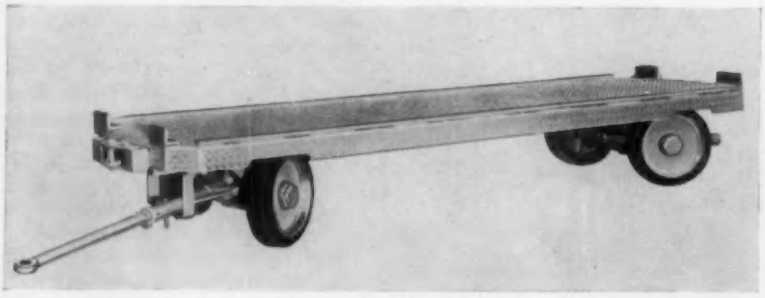
DEVELOPMENT of the DOWmatic HC-800, the first in a complete line of automated, controlled atmosphere, batch-type furnaces, has been announced. It automatically pre-conditions, loads and unloads the work chamber, and quenches the processed charge without operator handling. Featured on the HC-800 are pressurized operation, double elevator and automatic transfer mechanisms.

Assuming you start with a load in the work chamber and a pre-conditioned load on the upper elevator, the process operates as follows: At the end of the time interval for the load in the furnace, the inner door raises and the work is automatically placed on the double elevator. The elevator descends, quenching the work load and moving the pre-conditioned load into position in front of the inner door. As soon as the elevator is down, the charge moves into the work chamber and the door closes.

The second stage in the process occurs when the quenching cycle is completed. The outer door automatically opens allowing the "green" charge to move onto the upper elevator and the elevator raises. This moves the "green" charge into pre-conditioned position. The quenched work is automatically moved out onto the conveyor, the vestibule is automatically purged, and the outer door automatically closed. *Dow Furnace Co.*

Circle 36 on postcard for more data

New, Longer Industrial Trailer



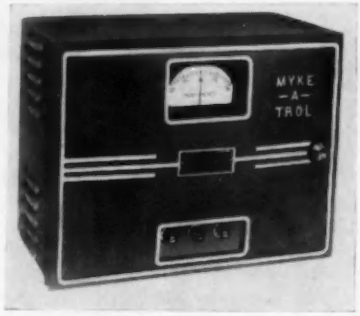
This standard 8000-lb capacity industrial trailer gives the advantages of longer length with increased carrying area and an improved trailer hitch. It has a one-piece checkered steel plate carrying platform of 128 in. in length and an overall length of 135⅜ in., and is available in platform widths of 38 and 48 in. The hitch is a simplified device which is connected or disconnected on either end of the trailer by removal of a single pin. Four wheel steer is accomplished through levers and connecting rods which assures perfect trailing in a train. The trailer is also available with an oak platform, steel bound with armored ends. (Yale & Towne Manufacturing Co.)

Circle 37 on postcard for more data

Electronic Control

CALLED the MYKE-A-TROL, a new unit containing a sensitive electronic control mechanism for controlling quality during actual processing, has been announced. It is designed for use with sensing elements, which are built into the gage heads, for automatic measuring applications, such as gaging and sorting, weighing, pressure control, fatigue testing, inspection and thickness control.

The control is provided by means of two power relays which can be adjusted to operate at the desired control point and on any of four sensitivity ranges. These relays can be made to operate on plus or minus tolerances; two successive plus tolerances; or two successive minus tolerances, by internal switching. In operation, a calibrated meter, operated independently of the relays, is located on the front panel to indicate the quantity being measured.



Industrial control

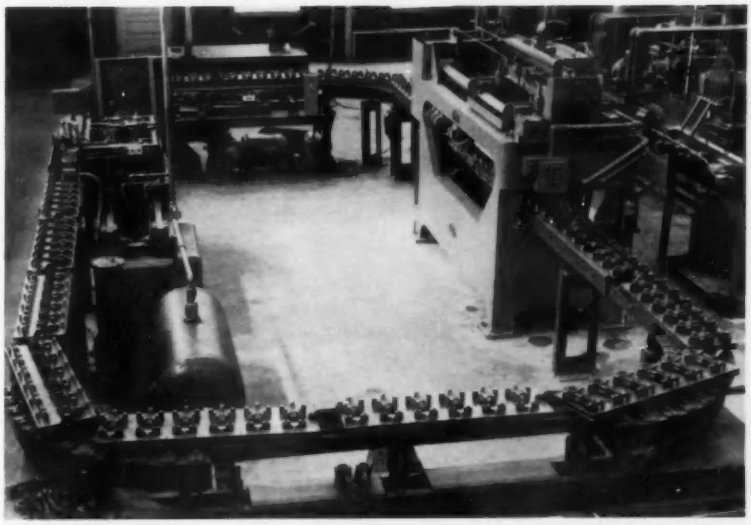
During the preview of this control, typical work applications were demonstrated. One involved grinding control, where the first limit stopped the grinding prior to finish size and sent the machine through the wheel dressing cycle and back to grinding; and the second limit stopped the grinding at the finish size and operated a counter. The next application shown was inspection and sorting, where the pieces, if within limits, were passed through undisturbed; or if outside limits, were sorted into oversize and undersize groups. In a demonstration of thickness control, the plus and minus controls automatically adjusted the rolls to maintain the desired thickness. In fatigue testing, the first limit counted the stress cycles; and the second limit stopped the process when the yield point was reached. *Industrial Electronics, Inc.*

Circle 38 on postcard for more data

Machine Automatically Assembles Connecting Rod Caps

AN assembly system which bolts bearing caps in place on automobile engine connecting rods has recently been completed. It is fully automatic after the connecting rods enter on fixtures on a continuously moving conveyor, ready for the bolts to be pressed in and nuts set. Operations are performed while the rods are traveling on the conveyor at a speed of approximately 22.8 fpm.

The connecting rods are placed on six-position fixtures, and move to the bolt-press unit positioned above the conveyor. At the proper time the bolt-press drops into position over the fixture and presses two bolts into each of the six connecting rods and caps. Upon completion of this operation, the bolt-press unit is automatically raised and returned to starting position to receive the next fixture. The conveyor then moves the fixture to the nut-setting unit powered by air motors. The nut-setting unit is located to one side of the conveyor, and also moves automatically to engage the nuts and set them to required torque. When this torque has been reached, the nut-setter automatically disengages from the nuts and returns to the starting position ready to receive the next fixture. The bolt press and nut setter are available to receive a fixture every 10.6 sec.



The Cleco machine illustrated is for bolting bearing caps in place on connecting rods. The nutsetter is at left, and the bolt press at right. Six connecting rods are carried along the conveyor by each of the fixtures which can be seen passing through the machine.

The bolt-press unit is electro-hydraulically powered; the nut-setting unit is electro-pneumatically powered. The machine has a capacity of 2000 connecting rods per hour. *Cleco Air Tools Div., Reed Roller Bit Co.*

Circle 39 on postcard for more data

Press Safety Device

THE SCI-200-1, a new electrical safety control for mechanically tripped (clutch operated) machines and presses, functions on "stored energy." When hand buttons are depressed, the line voltage is disconnected and the "stored energy" is released to operate an air motor or electric solenoid. Both hand buttons must be released to permit recharging the capacitor to produce "stored energy" for the next machine cycle.

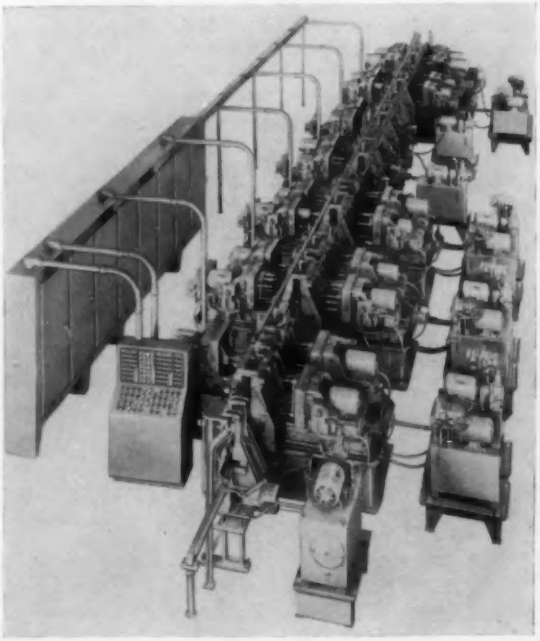
The device also incorporates a time delay adjustment that permits changing the time interval between the depression of the first and second hand buttons. In addition to non-repeat operation, the system can be changed by a selector switch to repeat operation for either hand or foot switch control. By this method the press continues to cycle as long as the hand button or foot switch is held down. If the button or foot switch is released, the press will stop and the entire cycle must be repeated. *Security Controls, Inc.*

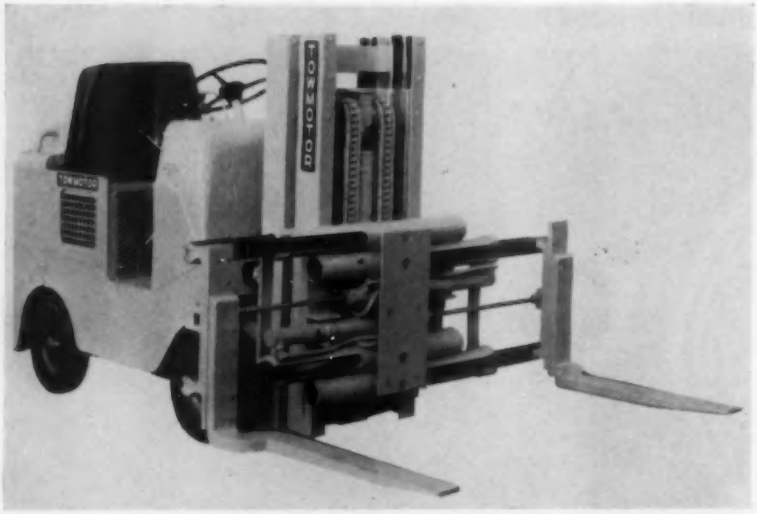
Circle 40 on postcard for more data

Twenty-Two Station Machine for Adapter Plates

The machine illustrated performs 155 operations on two types of torque converter adapter plates. Operations include 37 drilling, 12 reaming, 4 boring, 37 countersinking, 36 inspection and 29 tapping. The 22 stations are: 1 for loading, 14 for machining (with 2 for mechanical inspection), 6 for visual inspection and 1 for unloading. Each machining station is equipped with automatic part-selector for unit control. Chip disposal is through center of machine into conveyor in floor. Production rate is 200 pieces per hour at 100 per cent efficiency. (Buhr Machine Tool Co.)

Circle 41 on postcard for more data





Towmotor Model 500 fork lift truck equipped with multi-purpose clamps and forks

Multi-Purpose Attachment for Fork Lift Trucks

FORK lift trucks equipped with the hydraulic clamp and offset fork attachment illustrated, are said to provide quick adaptability for handling the diverse size, shape and character of products and raw materials which call for versatility in materials handling equipment. With the accessory, the lift truck carriage can be adjusted laterally to handle heavy loads of varying size and shape. This makes it suited to operations where a lift truck must be used interchangeably as a clamp truck and a fork lift truck, and to applications where a variety of different widths of pallet loads are handled. Hydraulic actuation of the clamp provides for quick adjustment of the forks.

The multi-purpose clamp and forks are shown attached to a Model 500 fork lift truck equipped with a double telescopic mast consisting of a primary and a secondary mast. Controlled separately by hydraulic levers located at the driver's position, the secondary mast can be used for low headroom stacking; while in a high stacking operation, both are used.

The Model 500, available with gasoline, LP-gas or Diesel power, has a lifting capacity of 5000 lb at 24-in. load center. *Towmotor Corp.*

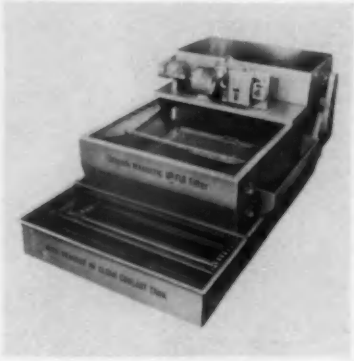
Circle 42 on postcard for more data

Improved Filter

THE Delpark Up-Flo filter with permanent, bar stock bronze screen has been redesigned to include the added feature of magnetic separation. This new method of magnetic separation makes use of a flat magnetic field on to which the liquids are diffused, and uses the force of gravity to assist the magnetic field.

The Up-Flo action carries the liquids that have been exposed to the magnetic field up through the permanent 0.004 in. bar stock screen to remove particles such as abrasives which do not respond to the magnets. The liquid flows into a storage tank where settled particles smaller than 0.004 in. are removed by chain driven flights. The bar stock screen is cleaned by air shakers which shake embedded particles from the screen. This residue, with the ferrous particles, is removed by separate chain driven flights. *Industrial Filtration Co.*

Circle 43 on postcard for more data



Delpark Up-Flo filter

PM Thickness Gage

A HAND-HELD, permanent - magnet thickness gage, which operates on a magnetic principle and requires no power, is designed for non-destructive measurement of the thickness of non-magnetic materials bonded to smooth iron or steel. The gage will also measure the thickness of non-magnetic materials which can be placed over a magnetic reference plate. Typical materials which can be measured are paint coatings, platings, enamels and sheet materials such as plastics, paper and mica.

The small, portable gage consists of a double range scale (high scale from 0.001 to 0.060-in. and low scale from 0.000 to 0.007-in.), range changing slider, calibration adjuster, adjustable limit pointers, and reference thickness standards. A "go-nogo" feature is built in to help the user maintain quality control on surface coating thicknesses. After the instrument is calibrated and adjusted for the specific range limits, the user need only note if the null pointer stays between the red upper limit and red lower limit pointers to maintain the desired quality.

The instrument uses an internal alnico magnet which provides flux to the contact feet. A variable air gap in the magnetic circuit, introduced by the variable thickness of the film on the backing material, causes flux changes in the circuit. The thicker the film the more flux will leak between two iron legs located between the magnet and the contact feet. A gauss-meter-type movement measures this internal leakage flux. *General Electic Co.*

Circle 44 on postcard for more data

Vibratory Parts Feeder

A RECENT addition to a line of vibratory parts feeders is the Model EB-3-B. Equipped with a 36-in. diam bowl, it will orient and feed parts up to eight-in. long in either a clockwise or counterclockwise direction.

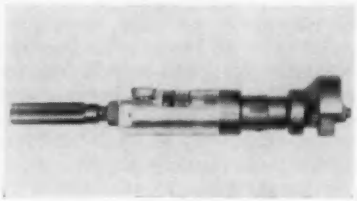
The unit can be equipped with single or dual discharge to gravity feed tracks for automatically feeding parts to processing, packaging and assembly line equipment. The parts feed rate can be regulated by adjusting a rheostat in the separate controller. Parts discharge from the gravity feed tracks is handled by solenoid and air-operated escapement mechanisms. *Syntron Co.*

Circle 45 on postcard for more data

Rotary Air Grinder

THE latest in a series of air and electric tools is the new 25G rotary air grinder, a unit which is derived from the company's No. 2 series. The announcement states it produces 23 per cent more power than former models in this series. It replaces Model OOD in the line.

Designed primarily for precision



Thor Model 25G air grinder

die work, the 25G grinder is adapted to production grinding operations and to bench duties. Weighing two lb, with an overall length of 11½ in., the tool has a wheel size of 1¾ in. bonded capacity. It operates at a speed of 20,000 rpm on air pressure of 90 lb. Other stated features of the Model 25G, in addition to increase in power and decreased weight, are a reduction in the number of working parts, a 360 deg adjustable exhaust position, and a thumb-type throttle for more sensitively controlled power feed. *Thor Power Tool Co.*

Circle 46 on postcard for more data

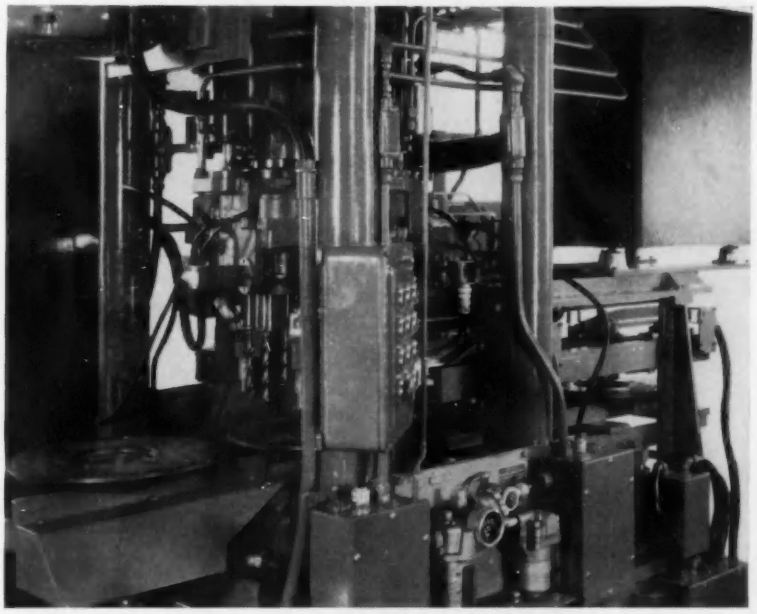
Ultrasonic Degreaser

THE first of a new series of ultrasonic degreasers has been announced. Designed for cleaning of fabricated parts in preparation for finishing or assembly, the unit is 24 by 10 by 18-in. deep and can accommodate work pieces 8 by 8 by 10-in. Two cleaning stages are featured, vapor degreasing and ultrasonic solvent cleaning, usable in the order desired. Solvents such as trichlorethylene can be used. Built-in components consist of pump, filter, solvent spray, heater, thermostats, and vapor condenser.

Ultrasonic power up to 500-w at 40 kc frequency is available over an area of 7 by 9-in. The generator is housed in a separate unit. The entire equipment operates from 110-v, 60-cycle power line, and consumes approximately 2500-w max. *Industrial and Scientific Products Div., Curtiss-Wright Corp.*

Circle 47 on postcard for more data

Machine Automatically Balances Flywheels



Developed recently for an automobile engine plant, this automatic machine is designed to balance flywheels at the rate of 125 pieces per hour. Installed in a conveyor system, the machine locates, measures and corrects unbalance without an operator. The design is said to be such as to make it suitable for other applications where the removal of material for balance may be limited to certain locations. (Micro-Poise Engineering & Sales Co.)

Circle 48 on postcard for more data

Gear Checker

THE Red Ring Model SIC-24 in. gear checker inspects spur gears up to 25½ in. OD, as well as splines, for accuracy of tooth size, spacing, eccentricity and parallelism. Spur gears and splined parts up to 11⅜ in.

Red Ring gear checker

between centers can be accommodated on the new checker.

A feature of the machine is the unique type of slot design in the table surface which positions the various checking units in precision straight line and right angle locations. Gears to be checked are mounted between centers on head and tailstock units that are slidably mounted through a slot in the top of a ribbed surface plate. Interchangeable heads are provided for checking eccentricity and size combination, and tooth-to-tooth spacing.

Parallelism accuracy of each side of a spur gear or spline tooth is checked by a double indicator head unit mounted in an LCA ball bearing slide unit in front of the part being checked. The base of the slide unit is locked in a slot in the surface plate which is at right angle location to the slot into which the head and tailstocks are locked. This slide unit has a 9-in. travel and moves the indicator finger across the tooth face with a handwheel control. Eccentricity and size are checked by an ECA indicator unit at the rear of the part being checked. The base of the ECA unit locks into a continuation of the same slot as the LCA slide unit. Tooth-to-tooth spacing is measured by removing the ECA unit and replacing it with an ICB tooth spacing head. *National Broach & Machine Co.*

Circle 49 on postcard for more data

Expert automatic welder uses in-line transfer automation concepts to combine projection welding and carbon dioxide shielded arc-welding operations.

Automated Welding Machine

AN automatic welding machine that utilizes automation concepts to combine projection welding and carbon dioxide arc welding in the assembly of two stamped spring support brackets to an automotive rear axle housing is announced. The new welder, which produces 130 welded assemblies per hour at 80 per cent efficiency, is an in-line transfer type machine in which the parts are automatically transferred from station-to-station with a mechanism powered by an air motor.

In operation, the two spring support brackets are first loaded into the fixture at the front of the machine by the operator. Then he loads the housing into the fixture and pushes a cycle control button. A locator pivots up and contacts the housing banjo surface locating it in correct radial location and inserting an expansion locator that contacts the inside of the banjo flange to center the housing in the machine. The two projection heads then come down and weld the brackets to the housing. The pivot locator retracts, the heads retract and an air powered lifting device raises the welded assembly. The transfer mechanism travels under the part and the lifter retracts, thus depositing the part on the transfer mechanism. This mechanism is utilized to move the part between all of the stations.

While transferring between station two and three, a cam turns the part so that the banjo is flat for the next operation. In the third station, another pivoted locator positions the part radially and centrally for the entry of centers in each end of the part. The live center which enters the part has an air-operated taper lock thus positioning the part in correct axial location for the welding operation. The driving center which enters the other end of the part is serrated and powered by an electric drive motor. When the part is properly positioned, it is rotated for the inert-gas welding operation performed by the four welding heads.

After finish-welding, the axle housing assembly is lowered to the transfer mechanism, and moved to station four where it is deposited on slide rails at the rear of the machine.

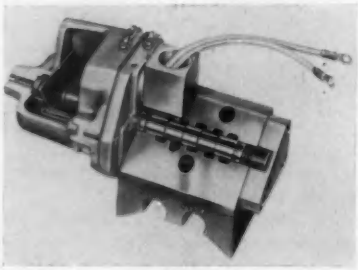
The welder is totally air-powered, except for the inert gas welding operation in which a one-hp motor drive rotates the part. Wire for the inert gas welding operation is fed automatically to the heads from hoppers at the side of the machine. The unit is about 8-ft high and occupies a floor space about 10 ft by 10 ft. *Expert Welding Machine Co.*

Circle 50 on postcard for more data

Multi-Purpose Valve

THE introduction of a multi-purpose valve which is said to combine the best design features of most current valves and to incorporate fast operation, compactness and light weight, was recently announced. Called the Comet II, the basic design is described as providing more than 100 model variations for a wide range of air and oil pressure applications. For example, it can be adapted to power a welding gun, air-operated transfer mechanisms, air riveting and testing fixtures. The valve completes a valve cycle within 0.033 sec, according to the announcement.

It is available with ¼ or ⅜ in. pipe tap for inline, manifold or base mounted; in single solenoid spring return, double solenoid momentary and double solenoid three position. These solenoid direct operated four-way spool-type valve arrangements can be used for straight-way or three-way functions by plugging ports.



Ross Comet II valve

The valve measures 7¼ by 3½ by 3⅞ in. Flow capacity is equal to a ¼-in. diam. hole. *Ross Operating Valve Co.*

Circle 51 on postcard for more data

High Flow Filter

DESIGNED for industrial use, a new series filter is for bulk handling of hydraulic fluids, chemicals, water, fuels, oils and compressible fluids. Built in various sizes, it is said to provide efficient filtration with low-pressure drop. The permanent porous bronze, cleanable filter elements can be furnished for filtering out solids from 80 microns down to 6.5 microns. *Arrow Tools, Inc.*

Circle 52 on postcard for more data

Electric Motor Line

IN announcing its re-entry into the electric motor field, a company has introduced a new line of motors which is claimed to represent a major advance in design through a unique extruded plastic insulation. The motors, available in standard sizes from 1 to 40 hp, are said to be the first in this range of sizes with extruded plastic insulation. The present line is built in the open type frame and torque design B. They comply with NEMA specifications.

The thermo-setting plastic insulation is molded into and around the stator windings. The motor stator is placed into a die, the plastic material is forced into the die under heat and pressure, and the liquid plastic resin is extruded through the stator slots, covering the stator winding.

The plastic, in extensive field test, is reported to have demonstrated exceptional resistance to chemical action, humidity, abrasive dust, lint and oil vapor. The insulation also gives thermal protection against "hot spots" because the plastic provides a medium for conducting the heat uniformly away, it is claimed. The new material is further said to provide a high degree of physical protection since the windings are securely anchored to the stator frame.

Even though the motor is built in the open type frame, the company states it may be used as a splash-proof motor. *Lincoln Electric Co.*

Circle 53 on postcard for more data

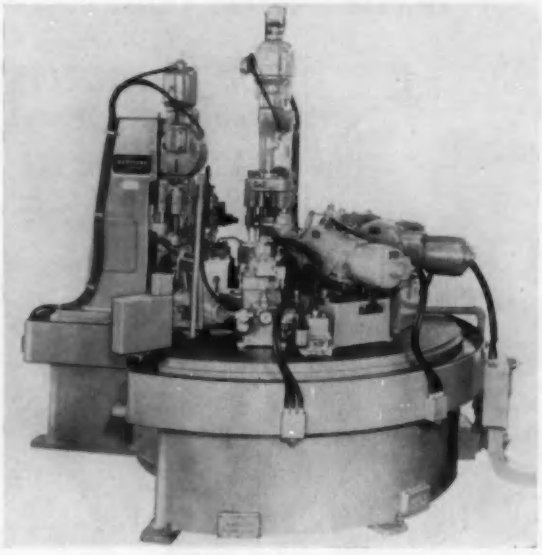
Conveyor Belting

CONVEYOR belting with a load-carrying carcass made of plies of frictioned cotton-nylon fabric, the fabric being woven from high tension cotton warps and nylon fillers, has been developed. It is designed for use where regular belting of the required number of plies and weight of duck is too heavy, where greater troughing would be advantageous when an installation does not have sufficient take-up room, or where small pulleys are encountered. It will trough and train better, has 25 per cent lighter carcass weight, has less stretch, and will operate over smaller pulleys at higher speeds, according to the announcement.

The company offers the above features in their Types 30, 50 and 70 belts for use where 32, 42 and 48-oz. cotton duck would normally be used. *Republic Rubber Div., Lee Rubber & Tire Corp.*

Circle 54 on postcard for more data

Twelve-Station Drilling and Milling Machine



This machine is used to drill, tap, slot straddle mill and broach nine different brass throttle shafts. Five cam feed drill units, one lead screw tapping unit and one air-operated broach process the parts, which are loaded in a vee-block with hand screw clamp and automatically indexed through the processing cycle. Production at 100 per cent efficiency is 600 parts per hour. (Hartford Special Machinery Co.)

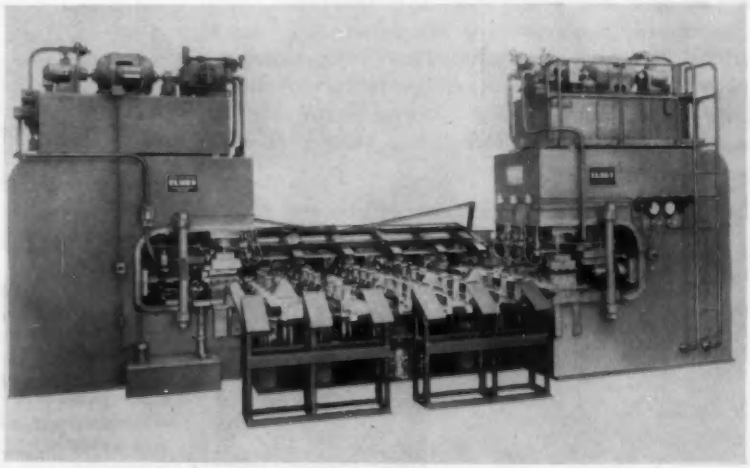
Circle 55 on postcard for more data

Automatic Tube-Reducing Press

IN design, construction, and operation, the custom-built tube-reducing press illustrated is an example of automation principles developed for application to hydraulic presses. Fully automatic in operation, this press removes a piece of tubing stock from a loaded magazine, positions the piece prior to its entering the machine, carries it into a three-stage work station where the reducing operations are performed, and then removes the finished tube from the machine and deposits it into a tote box. Conveyors can be provided in place of the loading magazine and tote box.

This particular machine is a completely self-contained unit equipped with two C-frame type stationary ends, each having three 25-ton tube clamp rams and three 10-ton reducing rams. The unit is designed to reduce the two ends of two-in. diam by 0.062 wall steel tube from 2 to 1¼ in. Available production is one tube reduced on both ends every 12 sec. Tubes up to 13 ft 6 in. max length and 54-in. minimum length are handled automatically through the press without any adjustment being made for handling the different length tubes. *Elmes Engineering Div., American Steel Foundries.*

Circle 56 on postcard for more data



Elmes tube-reducing press is fully automatic in operation

WE ROLL METAL

for scales that can detect the missing dot from an "i"

• Scale makers have borrowed a new kind of alloy used for springs in the finest watches—metal far springier than the finest steel. We call it Nilcor* . . . and produce it in widths from ⅛" to 1⅛", .0025" to .025" thick.

It's so hard and tough that only the finest, most advanced mill equipment and techniques can process it. Yet it is the most perfect material known for making the precision torsion bands used in laboratory scales . . . with more precise characteristics . . . greater stability . . . unmatched resistance to corrosion . . . longer life under repetitive bending.

Despite the difficulty of working Nilcor, the *Athenia Steel Division* of National-Standard gives it up to an 85% reduction and maintains tolerances as close as .0001".

It is this kind of ability that enables Athenia to develop practical applications of unique Nilcor and also makes Athenia a foremost supplier of special high carbon strip steel.

If you think you have a particular application requiring Nilcor, or if you need strip steel with unusual demands for tolerance, flatness, edge forming, uniformity, temper and other characteristics, try *Athenia*. And remember, small company or big company, we are eager to serve you. Write us.

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FREE LITERATURE

Honeycomb Adhesives 1

A 20-page technical bulletin gives engineering data on adhesives for honeycomb structures. Adhesive application procedures are described in detail. *Adhesives & Coatings Div., Minnesota Mining & Manufacturing Co.*

Roller Bearings 2

Book 2658 includes technical data on adjustable single-row and double-row roller bearings, and pre-adjusted double-row bearings. It also gives engineering selection information, dimensional specifications, and recommended fitting practices. *Link-Belt Co.*

Reduction Gears 3

Booklet DB 1165 describes high-speed reduction gears for mechanical-drive steam turbines having capacities ranging from 50 to 5000 hp. These gears permit the use of the high-speed steam turbine with slower-speed driven equipment such as pumps, fans, compressors, line shafts and generators. *Westinghouse Electric Corp.*

Stainless Machining 4

Bulletin TDC-182 provides data on the machining of stainless steel pipe and tubing. Drilling, threading, reaming, milling, and sawing are discussed, as well as tooling, power requirements, cutting oils, and finishing. *Tubular Products Div., Babcock & Wilcox Co.*

Molded Products 5

Bulletin 550 covers precision molded products for automotive, industrial and special applications. An engineering design data section enables the user to determine shapes and sizes in which precision molded products can best be produced. *Raybestos-Manhattan, Inc.*

Nut Design Data 6

A new edition of a 24-page engineering data section reviews the design and proper methods of installing standard and special 12-point and hexagon nuts, as well as locknuts. A guide chart for calculating wrench torques is included. *National Machine Products Co.*

Comparator Gages 7

Bulletin 200 features three all-purpose comparator gages for gaging external dimensions of parts having a variety of sizes and shapes. The most popular model gages to 10 millionths, 20 millionths, 1 ten thousandth or 2 ten thousandths in. *Metron Instrument Co.*

Die Casting 8

A detailed explanation of the techniques used in die casting small parts by a high-speed process is given in a 24-page illustrated catalog. Installation, operating techniques and maintenance are covered. *DCMT Diecasting Machines Div., British Industries Corp.*

(Please turn page)

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Solvent Detergent 9

A folder describes Oakite Composition No. 98, a solvent detergent which is said to clean and protect against rust at the same time and was designed especially for use in power washing machines. *Oakite Products, Inc.*

Chuck Control 10

"Selectrons" for automatic control of magnetic chucks are explained and illustrated in a four-page folder. The principles involved in the control of holding power and the automatic demagnetization of chuck and work are discussed. *DoALL Co.*

Resistance Welding 11

The latest issue of "Resistance Welding at Work," Vol. 4, No. 8, tells how Grumman Aircraft Engineering Corp. designed and resistance-welded the integral leading-edge, wing fuel tank for the F9F-8 Cougar Jet. Eight pages; illustrated. *Sciaky Bros., Inc.*

Ultrasonic Inspection 12

Besides explaining in simplified terms the principle of ultrasonic inspection, bulletin 50-105 discusses the application of the Reflectoscope for non-destructive testing of products and equipment. Eight pages; illustrated. *Sperry Products, Inc.*

Gear Deburring 13

Gear deburring and chamfering machines are described in Bulletin BM-1. Production rates, capacities and operating characteristics are given for all models. *Modern Industrial Engineering Co.*

USE THIS POSTCARD

Surface Measurement 14

An eight-page technical bulletin includes extracts from ASA Standard B46.1-1955 on surface roughness, waviness, and lay and provides a listing of instrument characteristics for roughness measurement. *Micrometrical Manufacturing Co.*

Indexing Units 15

Catalog 106 contains selection and application data on high-speed indexing mechanisms. *Ferguson Machine & Tool Co.*

Double-Action Presses 16

Double-action, straightside presses, ranging from 200 to 2000-ton capacity, are shown in an illustrated 28-page catalog, Series D, made available by *Danly Machine Specialties, Inc.*

Moisture Testing 17

Bulletin SL-1 describes and illustrates equipment for analyzing the amount of moisture in any solid, granular, liquid, or semiliquid material. *Harry W. Dietert Co.*

Gear Shaving 18

Catalog S-55-11, four pages, covers the operating principles of a machine designed to straight or crown-shave internal and external spur and helical gears. *National Broach and Machine Co.*

Oil Filtration 19

A four-page bulletin on the filtration of quenching oils discusses the changes that occur after repeated quenching operations, and explains how efficiency may be maintained. *Industrial Filtration Co.*

Wire Rope 20

Bulletin TL 500, 24 pages, contains data on the construction and breaking strengths of wire rope assemblies. It also lists combinations of fittings and assemblies for various applications. *American Chain & Cable Co.,*

Test Equipment 21

Several types of environmental test equipment are covered in a 16-page illustrated booklet issued by *Murphy & Miller, Inc.*

Threading Machines 22

A four-page catalog describing newly-designed automatic threading and chucking machines has been made available by *James Coulter Machine Co.*

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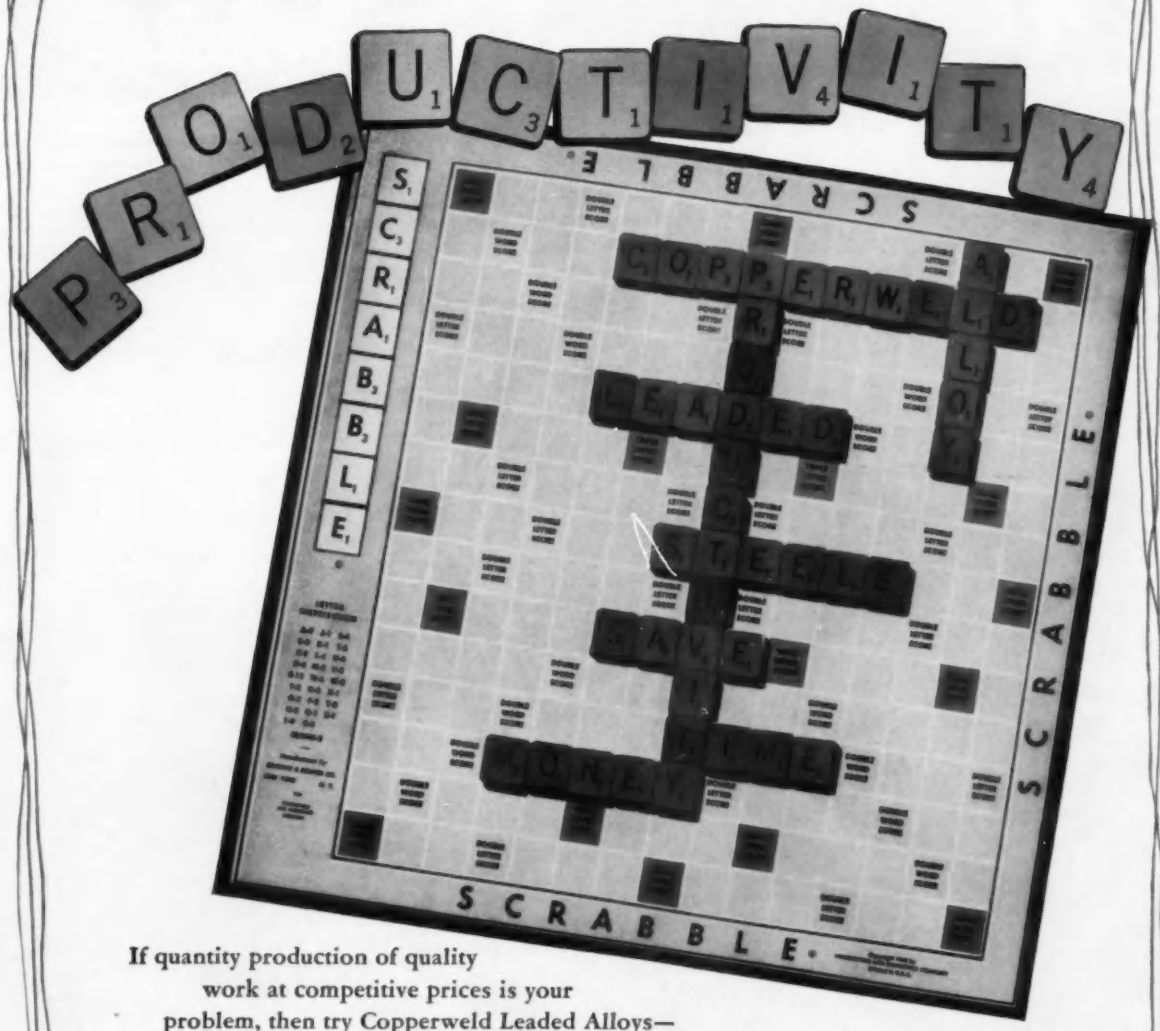

If quantity production of quality work at competitive prices is your problem, then try Copperweld Leaded Alloys—the steel with "built-in productivity." Copperweld Leaded Steels allow faster feeds and speeds, give longer tool life, and their finer finish often eliminates a finishing operation. Copperweld Leaded Steels can truly save you time and money.

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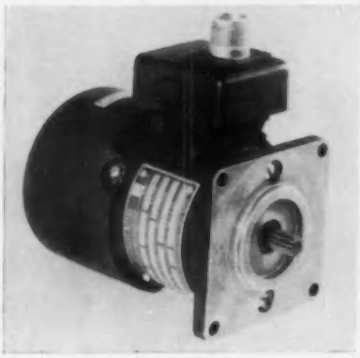
NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Aircraft Pump Motors

Continuous - duty explosion - proof aircraft motors, Type AK, for coolant pumps are available in a new line in ratings from 1/100 to 1/7 hp within



the speed range of 2800 to 14,000 rpm. This design will reportedly withstand and confine within itself an explosive mixture; and will also confine all sparks and flame preventing ignition of explosive mixtures surrounding it.

The construction is designed to minimize radiated and conducted radio interference. With the proper filter, inter-reference is said to be well within limits established by military requirements. Special brushes can be obtained to provide a minimum brush life of 500 hours at any altitude from sea level to 60,000 ft. *Westinghouse Electric Corp.*

Circle 60 on postcard for more data

Gold-Colored Aluminum

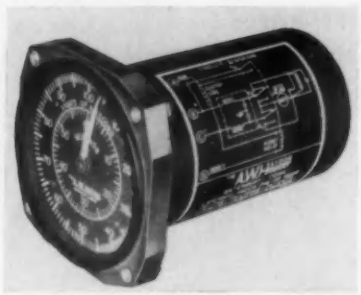
A new method of producing nonfading gold-colored aluminum in a variety of shades and tones has been developed. Source of the color is built into the metal itself. The color is brought out without the use of dyes or other coloring materials by anodizing under readily controlled conditions. The gold color may be varied from pale straw to deeper gold and gold-bronze tones, and the finish may be either bright or satin. Gold aluminum will soon be commercially available in sheet form. Development work is now in progress aimed at adapting the gold alloy to products in other forms, such as extrusions.

Production of the new gold aluminum begins with the addition of certain readily alloyed constituents to molten aluminum. The color of the resulting alloy is that of normal aluminum and remains so until it is anodized, at which time the surface takes on the gold color. In sheet form the new alloy for most applications will be applied as an integrated cladding on standard aluminum alloy sheet, in the same way that alclad sheet has been produced for many years to provide additional corrosion resistance. It is expected that normal practice in most applications will be to form the metal and fabricate the product or component prior to anodizing. *Kaiser Aluminum & Chemical Corp.*

Circle 61 on postcard for more data

Stop Clocks

The new K15300 Series stop clocks with electrical reset facilitate the accurate measurement of time intervals in both military and industrial applications, according to an announcement. Equipped with chronometrically governed d-c motors, they are said to be accurate to ± 0.20 per cent of reading ± 20 ms from −55 C to 85 C, over wide voltage variations. Elec-

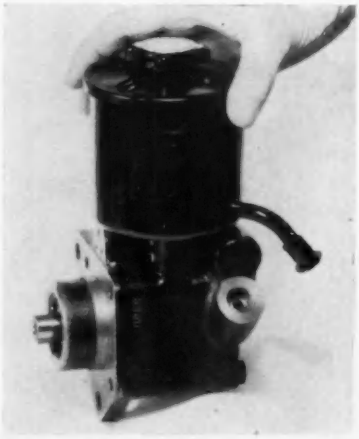


trical reset permits local or remote control or automatic operation for measuring successive time intervals. They may be used for calibration of intervalometers, fire control equipment, production testing of timing devices, controlling various process functions during material fabrication, test rigs, flight simulators, and wherever time intervals must be measured accurately. *The A. W. Hayden Co.*

Circle 62 on postcard for more data

Power Steering Pump

A new belt-driven pump for passenger car and truck oil-hydraulic power steering systems features reduced package size. Designated Model



VT-26, it measures in length 3-7/16 in. from mounting face to rear and 5-1/32 in. overall; and weighs 9.65 lb exclusive of bracket and pulley. Rated capacity is 5 gpm at 1200 rpm.

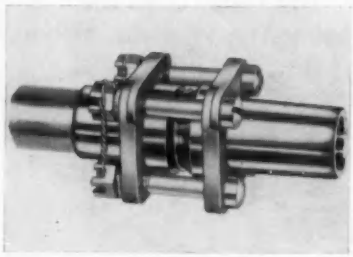
The relief valve provides system overload protection within a range of 750-1050 psi. The pump is designed for system operating pressures which vary between 100 and 1000 psi, depending on steering loads. The flow control limits delivery to the power steering system to 2.3 gpm regardless of engine speed and actually reduces flow at the higher rpm's where system delivery requirements are lower. A 27-cu in. external reservoir is mounted on top of the pump body. *Vickers Inc.*

Circle 63 on postcard for more data

Tubing Connector

A split-flange connector for joining tubing to tubing, or tubing to various kinds of equipment, with hydraulics, steam or gases, is now offered for general industrial use. It is a design which has been used on aircraft and ordnance equipment for hydraulic tubing connections.

In the simplest connection, that of



joining a piece of flared end tubing to a part with a tapered shoulder, the connector consists of a pair of split-flanges, one sleeve with a shoulder, and four bolts, nuts and lockwashers. The split-flanges are locked (one on the flared end tubing and one on the tapered end part) and are then tightened by the four bolts and nuts. For applications where extreme vibration may be encountered, a wirelock may be used. *Barco Manufacturing Co.*

Circle 64 on postcard for more data

Rigidized Metal

The addition of four new patterns to the line of Rigid-tex Metal, has been announced.

Pattern 1-SB (shadow box), with a maximum width produced of 7¾-in. and a maximum pattern depth of 0.012 in., is recommended for dial plates, appliance trim and similar applications. Pattern 2-SB (shadow box), has the same motif but of smaller size. Maximum width produced is 6 in., and it is recommended by manufacturer for passenger car interior trim, among other applications.

Pattern 1-BW (basket weave), with a maximum width produced of 7-in. and a maximum pattern depth of 0.025 in., is a basket weave design in metal recommended for wherever a bold texture is desired. It can be furnished perforated for radio and TV speaker grilles.

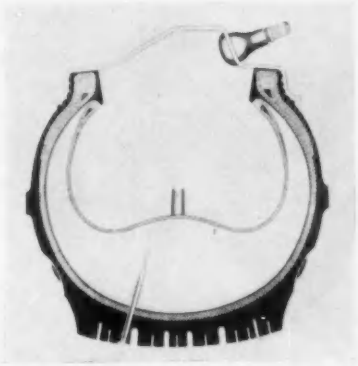
A new small hammered metal pattern is also now available. This is called pattern 2-HM. It has a maximum pattern depth of 0.008 in., is produced in a maximum 7¾-in. width, and is for meeting requests for a hammered metal design smaller in size than the 1-HM pattern. The smaller pattern can be used wherever a hand wrought appearance is desired. Pattern 1-ACC (alternating concave and convex), can now be obtained in a new maximum width of 36-in. Maximum pattern depth is 0.100 in.

All of the above patterns are produced in stainless steel, aluminum, or any metal, and in any finish of any color, solid or perforated. *Rigidized Metals Corp.*

Circle 65 on postcard for more data

Tire for Safety

A new tubeless tire designed to provide safety under modern superhighway driving conditions was recently announced. Named the Supreme, it has a specially compounded gummy sealant that prevents failures from nails and similar objects. The sealant clings to penetrating nails as shown in the illustration and prevents air leakage by flowing into and sealing small cuts and holes in the tire body. Blowout protection is assured by a specially contoured



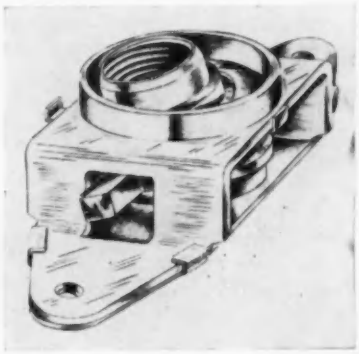
safety diaphragm which is made of two plies of rubberized nylon cord and an ingenious safety valve that automatically locks two-thirds of the air into its inner air chamber when the outer casing of the tire is ripped open or slashed.

Construction consists of four plies of rubberized nylon cord and specially compounded rubbers for each part of the tire. A special synthetic rubber is used on the inside of the tire because of its air retention qualities. A new cold rubber compounded with specially developed furnace blacks is used to make top tread.—*The Firestone Tire & Rubber Co.*

Circle 66 on postcard for more data

Self-Aligning Locknuts

For bolting attachments to large forgings in aircraft construction where misalignment of surfaces presents a fastening problem, a new line of anchor and gang channel self-



aligning locknuts has been designed. Based on a variation of the ball joint principle, they have a tilt range of 8-deg from centerline at any point. The nut body has a float of 0.020-in.

Performance of the self-aligning nuts is to specification AN-N-10; the nuts also meet twist-out and push-out requirements of MIL-N-25027 (ASG). Both configurations have a base chamfer for clearance of the fillet radius on forgings, castings and extrusions.

The gang channel nut body is made of carbon steel for use at moderate temperatures. Use of A286 alloy stainless steel for nut body of the anchor configuration permits its use where temperatures are as high as 800F. Thread sizes for the gang channel nut (LHG2822) are ¼-28 and 5/16-24. The anchor nut (LHA-2822) is designed in 10-32, ¼-28 and 5/16-24 sizes. *Elastic Stop Nut Corp. of America.*

Circle 67 on postcard for more data

Welding Materials

Two new welding products, called "135" Ni-o-nel electrode and "65" Ni-o-nel filler wire and rod, have recently been developed to weld Ni-o-nel nickel-iron-chromium alloy. The electrode and filler wire rod are said to enable the laying of sound beads and to give X-ray quality welds which have corrosion resistance and strength equal to that of the base metal itself. Both products are available in several convenient diameters. *The International Nickel Co., Inc.*

Circle 68 on postcard for more data

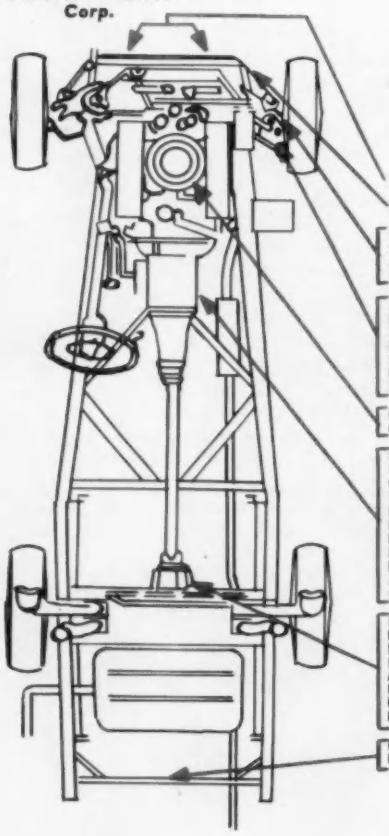
Drop Forgings Keep Pace With New Automotive Developments

OVER 400 million drop forgings weighing approximately 2 billion lb will be used for passenger car production during 1956 based on data compiled by the Drop Forging Association for AUTOMOTIVE INDUSTRIES. In a composite 1956 automobile, there are 63 drop forgings which weigh a total of 303.49 lb per car. All but four of the parts are used in the automobile's running gear, engine, and transmission.

Automatic transmissions consume the largest number of the 63 drop forgings with 19 parts for slightly over 30 per cent of the total. New V-8 engines use the largest amount by weight with 108.5 lb which accounts for more than 35 per cent of the total poundage.

It is because of the special characteristics obtained with forged metal that the power and speed of current production passenger cars has been achieved. Forgings have the ability to resist the many powerful stresses, especially dynamic stresses, imposed by today's cars.

Courtesy Oldsmobile Division, General Motors Corp.



FORGINGS USED ON A COMPOSITE 1956 AUTOMOBILE

PART NAME	NO. PER CAR	UNIT WEIGHT	WEIGHT PER CAR
Front Bumper Secondary Bar	2	10.23	20.46
Front Stabilizer Shaft	1	6.65	6.65
Knuckle Support	2	6.23	12.46
Steering Knuckle	2	6.83	13.66
Steering Knuckle Arm	2	2.3	4.60
Upper Control Arm Shaft	2	1.3	2.60
Piston Rack	1	7.25	7.25
Lower Flange	2	.71	1.42
Steering Worm	1	1.66	1.66
Pitman Shaft Gear	1	4.56	4.56
Steering Upper Flange	1	.89	.89
Pitman Arm	1	2.75	2.75
Idler Arm	1	.85	.85
Crankshaft	1	78.50	78.50
Connecting Rod	8	2.5	20.00
Front Sprag Clutch Outer Race	1	.89	.89
Rear Sprag Outer Race	1	6.35	6.35
Output Shaft	1	12.16	12.16
Rear Clutch Drum Sleeve	1	1.15	1.15
Parking Brake Pawl	1	.38	.38
Planet Pinion Front	4	.34	1.36
Planet Pinion Rear	4	.34	1.36
Planet Pinion Reverse	3	.73	2.19
Front Sprag Inner Race	1	.50	.50
Rear Pump Drive Gear	1	1.19	1.19
Rear Pump Driven Gear	1	1.09	1.09
Ring Gear	1	11.90	11.90
Pinion	1	9.4	9.40
Differential Pinion	2	3.65	7.30
Differential Sidegear	2	2.74	5.48
Axle Shaft	2	17.80	35.60
Propeller Shaft Yoke	2	3.81	7.62
Univ. Joint Cross Spider	2	1.55	3.10
Universal Joint Flange	1	2.68	2.68
Rear Stabilizer Shaft	1	3.52	3.52
Rear Bumper Secondary Bar	2	4.98	9.96
Total Parts	63	Total Weight	303.49

Equally important is the high uniform strength and overall quality that can be readily achieved from one piece to the next during a production run.

In many respects, a steel forging has been thought of as synonymous with safety. For years, where safety depended upon unfailing reliability in such components as steering arms, steering knuckles, and axles, forgings have provided the necessary engineering qualifications.

Resistance to shock, impact, fatigue, wear and vibration qualify forged parts for use in many mechanical innovations yet to come in the automobile industry. Both fuel injection systems and turbine engines suggest jobs for forgings. Ride control mechanisms offer other applications. A continual emergence of new uses is both a signal and an assurance that virtually every improvement in automotive design brings corresponding new jobs for forgings.

• • •

Rheem Starts Moving To New Calif. Plant

When Rheem Automotive Co. starts operations in its new plant in Fullerton, Calif., this August, it will become the largest manufacturer of automotive parts west of Chicago. The company last month started moving all machinery and equipment from its present unit at Vernon to the new $7 million facility.

The 400,000 sq ft plant will incorporate the latest automation features and include modern plating lines estimated to cost more than $2 million. It will produce bumpers, bumper guards, bumper hangers, and coil and leaf spring suspension systems, in addition to other automotive parts.

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METALS

Steel Price Rise, to Follow Expected Wage Boost, May Be Substantial. Nickel Price Is Steady, Aluminum Up.

By William F. Boericke

Steel Prices to Advance

Steel company executives have announced that prices for their products must advance. The forthcoming wage negotiations are practically certain to result in a substantial increase for members of the Steelworkers union, and this will be promptly followed by an across-the-board hike in steel prices. The extent of the rise will be influenced by the increase granted to the unions, but it may not be limited entirely to compensating for such an increase.

Some industry leaders, notably the chairman of National Steel, are calling for a rise in steel prices now in order to pay for the great five-year expansion program. This increase would be independent of any increase resulting from the granting of higher wages in July. It was suggested that steel company managements take this step without waiting for price leadership from U. S. Steel Corp., which traditionally has set the pattern for the industry. Other advocates of higher prices included chief executives of Republic Steel, Pittsburgh Steel, and Granite City Steel.

Higher Profits Needed

Following the steel wage settlement last year prices were advanced $7.35 per ton. Few expect that the new increase will be any less than this, most expect it will be more. The old rule-of-thumb, that steel prices should advance about 40 times the hourly rate increase granted to workers, is unlikely to hold. Such a ratio would call for $8 per ton increase for a 20 cent hourly wage raise; but this would probably be no more than compensatory and, thus, would not include the higher profits needed to attract the tremendous capital for the 18 million tons of additional capacity required by 1961, which, in round figures, would cost $3-$3½ billion. At least one steel president, Avery C. Adams of Pittsburgh Steel, asks $12-$15 a ton price boost to improve return on capital, which would be exclusive of the amount needed to compensate for wage increases.

However, it appears rather unlikely that any general price hike will be made before the wage negotiations. It would stiffen demands by union leaders who already have their target set high.

Steel Costs Advance

Steel producers can make a good case for higher prices regardless of the outcome at the bargaining table. Their raw materials have advanced. Iron ore is up 75 cents a ton over last July; pig iron is up $1.50 a ton; freight rates, both railroad and water, are higher; and the price of scrap has zoomed to an all-time high of over $53.50 per ton. Only trifling increases have been made in steel prices thus far to compensate, principally for extras.

Consumers Buy for Inventory

Consumers of course are not blind to the picture. Without much doubt some of the hectic buying in the last few months has been to build up inventories as a hedge against higher prices after July. This is acknowledged by most mills, but the amount of such buying is not believed to be large. It has been pointed out that there is very little to be gained in buying certain flat rolled products for storage because of the danger of age hardening. The increased scrap loss, which might be as high as 15 per cent, could exceed any price saving by storing.

There is less danger with structurals and plates, but these are in such scarce supply that unusual orders would be carefully scrutinized if inventory buying were suspected.

Structurals and Plates Scarce

March was the biggest month in history for the steel industry, with production totaling 10.9 million tons. The first quarter output came to 31.8 million tons. The volume of orders stays 15-30 per cent ahead of shipments, and mills are making little progress in cutting down heavy backlogs. Cold rolled sheets, formerly one of the items in easier supply because of the cutback in Detroit, are again being sought. Structurals and steel plates are so tight that premiums are being paid and their scarcity has seriously curtailed the freight car builders.

The Pennsylvania R.R. had to cut back its program and lay off men because of inability to get steel. Although about 14 tons of steel are needed to build a freight car, the steel producers would like to favor the freight car builders because more cars would then be available to move their products.

(*Turn to page* 120, *please*)

Using

DU PONT ELASTOMERS

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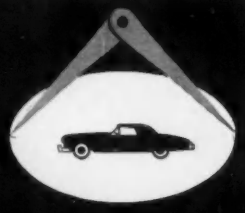


in Design

New opportunities in design—
Colored HYPALON® is highly resistant to ozone and weather

HYPALON, Du Pont's new synthetic rubber, can be compounded in white or in an unlimited range of brilliant colors that remain stable under exposure to light. This offers style-conscious designers the services of a rugged elastomer, capable of blending beautifully with any of the various automotive paint colors.

Of practical importance to the rubber stylist is the fact that the entire rubber part need not be HYPALON. Ordinary rubber can be dressed up in a colorful HYPALON coating—applied either as a liquid or as a mechanical skin. Such coatings, or veneers, bond well to most other elastomers, and they are as free to flex and stretch as the rubber part to which they are applied.

HYPALON's resistance to weathering and ultraviolet light has been demonstrated in long-time exposure tests in Florida and Delaware. Brightly colored specimens, in a variety of shades and hues, were exposed to the elements for thirty months with negligible effect on properties or appearance.

In addition to resistance to sunlight and weather, HYPALON has unusual resistance to ozone. In fact, no HYPALON product has ever been reported to develop an ozone crack, not even the HYPALON gaskets used to seal laboratory and commercial ozone generators in which the ozone concentration may reach six per cent.

Investigate the possibilities for using HYPALON in automotive design by mailing the coupon at the right.

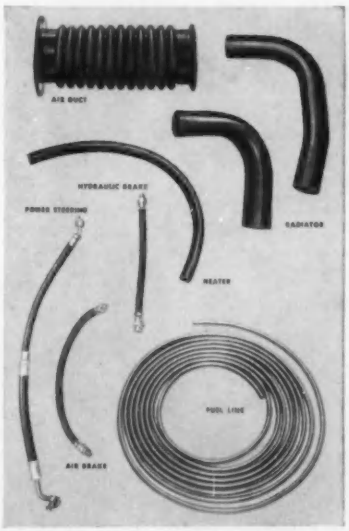
NEOPRENE demonstrates its versatility, long service life in hose and tubing

Resistance to oil, ozone, heat and weather—key advantages

There's a lot of hose on a car, and it's subject to all manner of abuse. Heat, hot oil and ozone combine to attack any rubber material under the hood, and weathering is an ever-present problem. It takes an unusual —and versatile—rubber to take this kind of punishment. That's why neoprene is used by so many car manufacturers for hose and tubing.

In the photograph at the right you will find some of the many hose and tubing applications for neoprene. On radiator and heater hose the neoprene *cover* resists the attack of heat and ozone and the neoprene *tube* resists the soluble-oil rust inhibitors used in anti-freeze. Hydraulic brake hose is protected by neoprene from heat, ozone and weather. Power steering hose—with cover and tube of neoprene—gives extra-long service despite exposure to heat and ozone on the outside, and to hot oil on the inside.

The list of hose and tubing applications for neoprene continues to grow, but neoprene has many other uses in the automotive industry. It's being used as a diaphragm in power-brake units because it can withstand heat and flexing. Resistance to ozone, oil and engine heat make neoprene the standard for jacketing on ignition wire. You'll also find neoprene used in seals and boots, flexible couplings, and as a saturant in paper gaskets.



MANY VARIETIES of neoprene hose and tubing serve the automotive industry. All have this in common: extra-long service life.

How can you use neoprene's unique *balanced combination* of properties? Further property and application data are available. Just clip and mail coupon below.

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Please send further information and add my name to the mailing list for your free publications, the "NEOPRENE NOTEBOOK" and "Facts About HYPALON®", which show how the Du Pont elastomers are used in design. I am particularly interested in

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Elastomers Division, Dept. AI-5
Wilmington 98, Delaware

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Observations

By Joseph Geschelin

Japanese Industry

In discussing the situation in Japan with a visiting automotive engineer, we learned that some of the major automotive producers there are planning to expand motor car production. At present, expansion is being held up by lack of modern production equipment and conveyors. The Japanese could use machine tools from the U.S.A.; however, they are faced with the problem of exchange. Right now they do not have enough dollars but do have sterling. Hence they can buy from England but can't buy here. It does offer an opportunity to buy some of the US-type equipment being built on licenses by British manufacturers.

Central Power

We have noted on occasion the real demand for some form of central power source to take care of the growth of hydraulic mechanism in motor cars. A recent check indicates that a number of companies are working on it. In fact, one major parts maker told us to expect installations in 1957 cars of some makes.

Smaller Packages

Many motor car engineers are beginning to think in terms of smaller and lighter weight cars. At the moment the trend is up — but they visualize a stopping point in the near future. Smaller and lighter packages would make it easier to shift downward to smaller powerplants and higher fuel economy.

Design Critics

Being a neutral we are at the receiving end of criticism of motor car design, more recently on the part of some prominent engineers. We can report briefly that they want to know why cars are so big; why engines are getting bigger; why there is no concern about fuel economy. Our own feeling is that the industry is producing what the public wants. And that is a good reason for doing what is being done.

Nuclear Power

Peaceful uses of atomic energy are being accelerated, according to Dr. T. K. Glennan, Case Institute president. However, he dismisses any possibility that this type of energy can be applied to road vehicles. In fact, he urges automotive designers to concentrate on the gas turbine as the next significant advance in powerplants.

Rarer Metals

The tremendous advances now being made in the production of certain critical metals have been made possible by the development of vacuum melting and the use of consumable electrodes. So said the panel on forging of rare metals at the recent SAE Production Meeting. The rise shows no signs of letting up either. For example, the production of titanium—a laboratory curiosity only a few years ago—is expected to rise to 9 to 10 million lb in 1956. Zirconium production—for atomic energy uses—is expected to rise to 2.5 million lb by 1958, and the cost per pound is expected to drop in that time from $18 to $10.

Easier Cutting

Discussion of the free machining screw steels at the SAE Production Meeting emphasized the variety of commercial grades both in high-sulfur and leaded types. We presume the user will have to determine for himself which type and grade will best meet his own requirements. Hans Ernst presented a brief summary of the physics of metal cutting, concluded that the mechanism of lead and sulfur additions was aimed at reducing friction during the cutting cycle.

Ball Joint

We hear that ball joint suspension at the front end is gaining in favor. Likely to be found on a number of makes for '57.

Four Lamps

If motor vehicle administrators approve quickly enough, most 1957 motor cars are expected to blossom out with four headlamps mounted horizontally across the front end. This will give stylists an opportunity to develop an entirely new twist in front end appearance. At the start of the program the lamps will probably be of smaller diameter. Since we understand that four, seven-inch lamps will do a better job of lighting the road, perhaps the stylists will go for this as a way of changing front end appearance on future models.

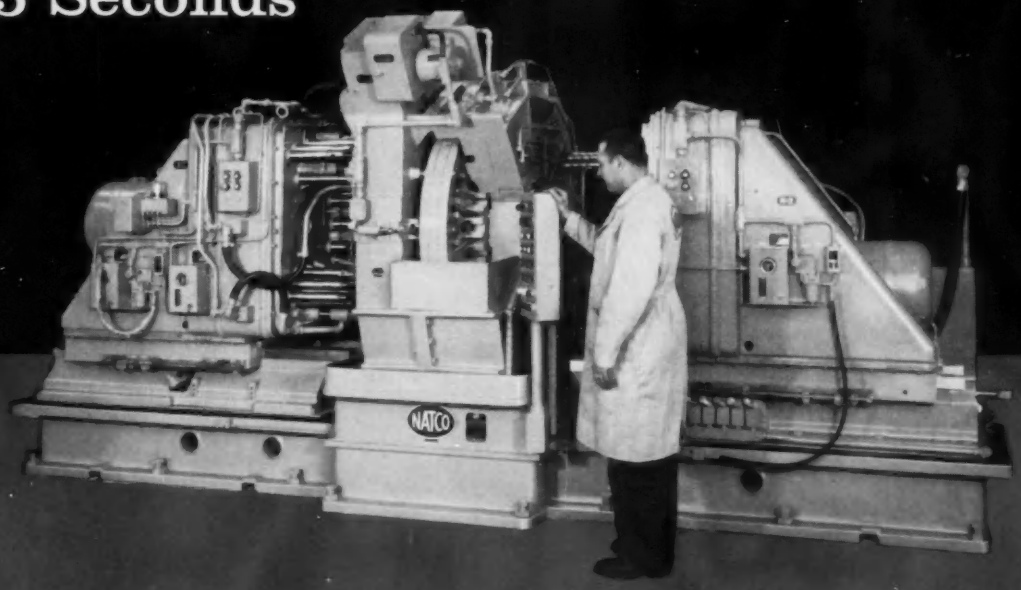
Preventive Maintenance

Addressing a luncheon meeting of the AIIE in Cleveland recently, J. A. Bradner, Lees-Bradner president, urged machine tool users to establish good PM practices in connection with modern automatic machine tools. At the same time, Bliss issued a statement drawing attention to its new program of preventive maintenance, free to users of Bliss presses. In essence, this free service consists of an expert visual inspection of the press with special attention to five points: need for adjustment; evidence of press overloading; worn parts; operator safety; possible modernization. It is claimed that such reports frequently lead to increased productivity; also serve as an indicator of early maintenance to prevent breakage or shut-down.

Automatic Transmissions

Recent announcement of the six-speed automatic transmission for Chevrolet trucks spotlights the unquestioned trend to fully automatic drives for heavy duty vehicles. A number of well known transmission builders have automatic drives in the test stages at this writing. Meanwhile, the Fuller Roadranger has been redesigned and further simplified, indicating that this form of drive is expected to fill a definite demand for some years to come.

Natco HOLESTEEL® Performs 17 Operations Every 15 Seconds



Performance—this Natco 2-way horizontal drilling machine produces 250 steering knuckles per hour. Holds limits as close as .004". Parts are clamped automatically in the interlocked trunnion fixture—spotdrilled, drilled, spotfaced, reamed and counterbored.

Features—Automatic time delay reverse, positive stop, coolant system with magnetic chip separator, automatic lubrication to heads and ways, hydraulic feed and J. I. C. compliance. Let a Natco field engineer help you with your drilling, boring, facing and tapping problems.

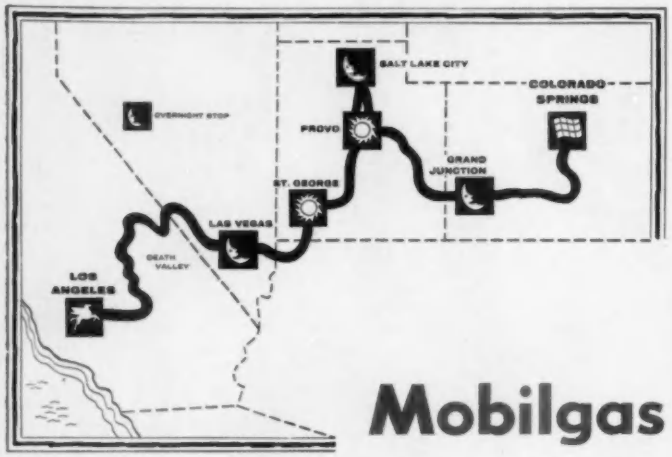
Ask for information about the PAYD (Pay-As-You-Depreciate) finance plan.

NATIONAL AUTOMATIC TOOL COMPANY, INC.
Richmond, Indiana

NATCO

Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

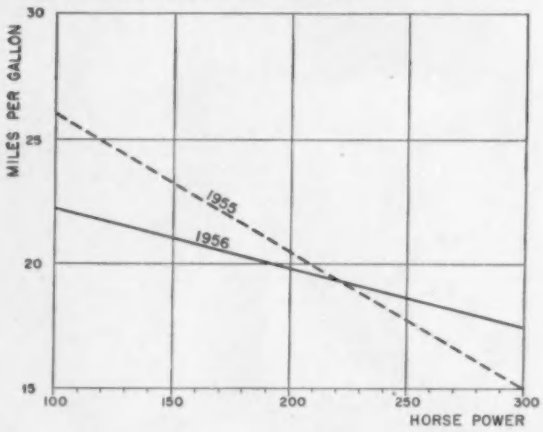
Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production



By Max Epps
Fuels Consultant
General Petroleum Corp., Los Angeles

1956 Mobilgas Economy Run

MILES PER GALLON VS. HORSEPOWER



Results of the 1956 Mobilgas Economy Run

	Place	Miles Per Gallon	Ton Miles Per Gallon
Special Lightweight Class			
Rambler De Luxe 6	1	24.3545	48.2218
Studebaker Champion 6	2	20.0467	39.7426
Low Price			
Ford Customline Victoria 8	1	20.5217	47.7643
Plymouth Belvedere 8	2	20.6793	47.7381
Chevrolet Bel Air Sport Sedan 6	3	21.1715	47.2124
Chevrolet Bel Air Sport Sedan 8	4	20.7032	46.3752
Ford Fairlane Victoria 8	5	18.7496	44.2490
Low Medium Price			
Pontiac Chieftain Catalina	1	21.1096	51.7297
Dodge Coronet 500 V-8	2	20.9012	50.1419
Mercury Montclair Phaeton	3	19.1552	47.6965
Medium Price			
Oldsmobile 88 Holiday De Luxe	1	19.7044	50.8077
Nash Ambassador Special V-8 Super	2	20.7124	47.9907
Hudson Hornet Special V-8 Super	3	20.4894	47.4944
Upper Medium Price			
Oldsmobile 98 Holiday De Luxe	1	18.6694	50.9488
Buick Super Riviera	2	17.7798	48.9566
DeSoto Fireflite Sportsman	3	17.8341	47.3496
High Price			
Imperial Southampton	1	21.0420	61.3796
Packard 400	2	18.0750	50.3207
Buick Roadmaster Riviera	3	17.4191	48.2510

Sweepstakes Winner — Imperial Southampton
Driver — Mel Asbury, Jr.
Average miles per gallon all cars — 19.9536
Average ton miles per gallon all cars — 48.6511
Average speed all cars — 40.9905

THE Mobilgas Economy Run, like other well-known automotive events, is fundamentally a promotion. Its objective is to publicize and stimulate an interest in better gasoline mileage. Unlike many other events, it presents a gold mine of data. It combines a representative group of cars, a wide range of conditions, and a lot of very accurate measurements.

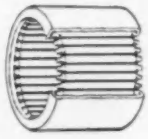
One of the most intriguing facts of this annual event is to see what light it can shed on the price of higher horsepower and flashing performance in terms of fuel consumption. Last year we examined this feature (AUTOMOTIVE INDUSTRIES, May 1, 1955, p. 59) and concluded that horsepower was becoming a less expensive luxury. This year again, we can make a rather simple approach by plotting the miles per gallon against horsepower for the various cars. Taken by itself, this simply shows that by increasing the power we generally sacrifice some mileage. Now it happens that in both the 1955 and 1956 Runs only automatic transmissions were used and the Run did go between the same start and finish points, although by different routes. In 1956 the route was more difficult and we observed that some auxiliary cars which had accompanied the Run both last year and this year turned in appreciably less mileage this time.

We can, however, balance out some of the course differences by simply looking at the slope of the miles per gallon versus horsepower line. If we plot this for both 1955 and 1956 on the same scale, we see a very significant thing. Horsepower in the high range is actually improving in economy over last year. If we look at the left-hand side of the curve and assume that it indicates the incremental severity of the course, then the improvement is more striking.

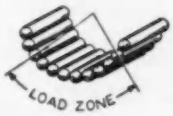
The Mobilgas Economy Run is dedicated to the cause of getting more mileage as well as power from the gasoline dollar. It is certainly demonstrating progress along this line very graphically.

TORRINGTON

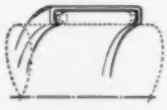
DC needle bearings give high-capacity performance in minimum space



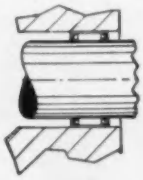
Unique construction—accurately drawn, surface-hardened shell retains rollers and serves as outer raceway.



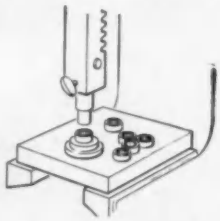
Full complement of small diameter rollers—precision-ground and through-hardened—assures top capacity by distributing load over large number of contacts.



Turned-in lips of the case-hardened outer shell keep dirt and grit out, lubricants in—while retaining trunnion ends of rollers. All wear surfaces of outer race are case-hardened.



No inner race required on surface-hardened shafts—reduces space requirements, lowers unit costs.



Simple assembly—arbor press seats bearing in round housing bore. No collars, shoulders or retaining rings needed.

Closed end type DC Needle Bearings are available for stub shaft applications. The closed end provides a perfect seal at no extra cost.

Needle Bearings are made in a Precision Series for most applications and an Extra Precision Series where low radial play and minimum eccentricity are required. Easy lubrication through optional hole in shell or through hole in shaft assures long service life. Bearings can be pre-packed with suitable grease for those applications requiring grease lubrication.

See our new Needle Bearing Catalog in the 1955 Sweet's Product Design File—or write direct for Catalog No. 55.

THE TORRINGTON COMPANY
Torrington, Conn. **South Bend 21, Ind.**

District offices and distributors in principal cities of United States and Canada

TORRINGTON BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

METALLURGY of Automatic Transmission Gears

(*Continued from page* 70)

as produced in identical steels from different steel producers are a prime factor in tool life, surface finish and secondary machining operations. Improved annealing and normalizing cycles will inherently contribute to greater usage of primary raw forms such as bar stock and tubing.

One of the new manufacturing methods being developed for gearing is the cold rolling or forming of gear tooth forms. Several manufacturers are studying this process and the results, as known now, indicate excellent possibilities for success. This method basically is a centerless type, through feed continuous method of rolling gear teeth on bar stock. The test samples which have been made by this method show that one of the prime factors in the success of this development will be the uniformity of the raw material, both from a hardness and micro-structure standpoint.

The broaching of internal gears is not a function or new development as such, but it is fairly new when applied to helical angled gears. This process also has high productivity at a low capital investment, lower tool cost and savings of valuable floor space. Careful engineering design is necessary to partake of all the advantages of this gear cutting process. The problem of machinability is very critical to the successful application of the broaching method. Gear tooth defects such as tearing and pick-up are directly related to both hardness and microstructure. Maintaining these raw material conditions within uniform closely controlled ranges, will allow gear manufacturers to take full advantage of this low tool cost, high productive process.

Study of casting methods for more precision as-cast dimensions to eliminate or minimize the machining operations is a continuous development. Different alloys and new alloys are being developed to be more homogeneous in structure and heat treat response. The development of these alloys to give higher physical properties and still maintain the present machinability will allow the further application of castings to automatic transmission gears.

The foregoing article is based on the paper, "Automatic Transmission Gear Materials and Associated Problems," which was presented by the authors at the 1956 SAE Passenger Car, Body and Materials Meeting in Detroit.

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this NEW "45" INDEX MILL

has the "CALIBER" and "ACCURACY" to do your MILLING, DRILLING and BORING JOBS .. BETTER, FASTER AND MORE ECONOMICALLY!

A FULL RANGE OF OTHER MODELS.

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Write for Literature.

INDEX MACHINE CO.

551 N. MECHANIC STREET JACKSON, MICHIGAN

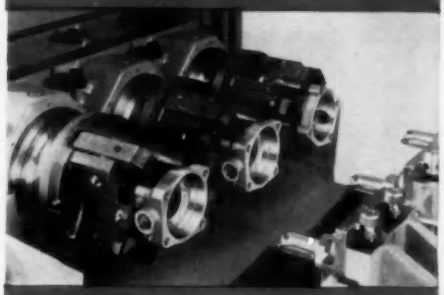
American Chemical Society

(*Continued from page* 71)

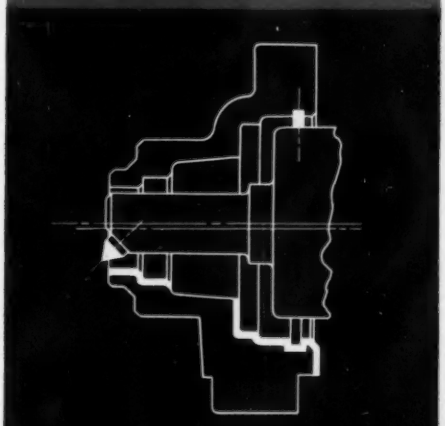
hazard of surface ignition also becomes greater. Sweeney was sure, however, that additives could be made available to reduce, if not eliminate, this phenomenon.

Incidentally, realtors around Dallas were speculating that a prominent real estate man from the east was buying an enormous tract just north of Dallas on behalf of a certain Detroit manufacturer. This is just gossip, of course. But maybe another assembly plant is in the making to supplement the Ford and B-O-P plants now in operation here.

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED



Showing parts mounted in the chuck. Without chuck changes, any of three parts having different exterior forms but identical interior contours can be accommodated.



Heavy lines denote surfaces machined. 12 operations are performed in one machine cycle.

INTRICATE CONTOURING IS FAST, ACCURATE ON

Ex-Cell-O's Cam Operated, Precision Boring Machine

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with better accuracy, versatility, speed and flexibility in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

Cams can be changed in minutes. Cam assembly swings out for quick, easy change of operation. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base.

Contact your Ex-Cell-O representative or write direct for complete information.

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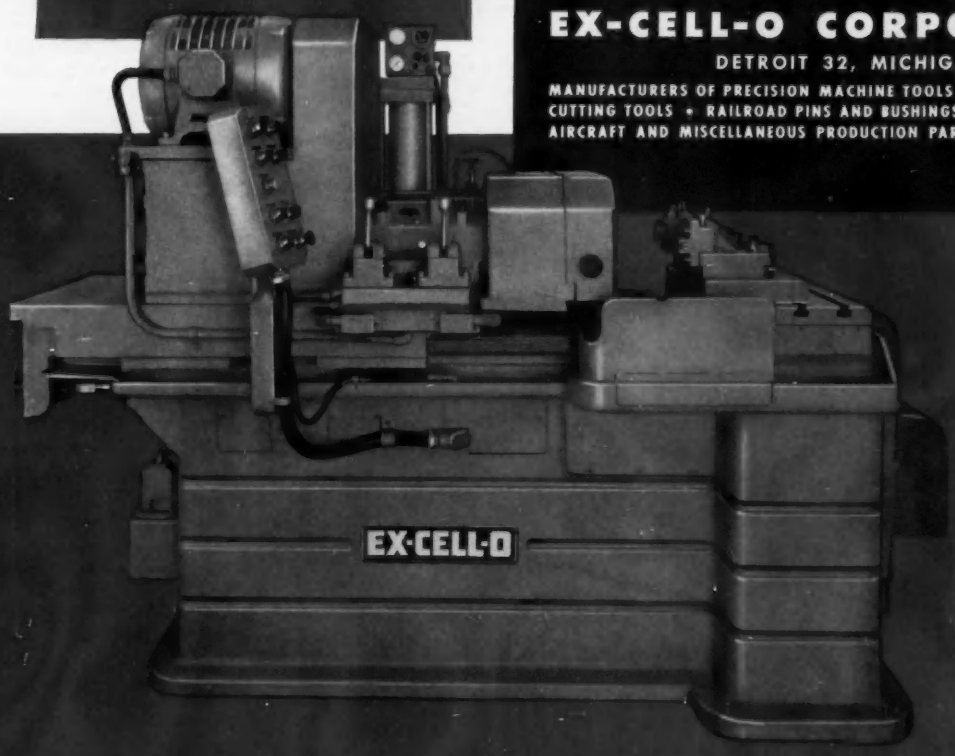
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-7



The Ex-Cell-O Style 312 Precision Boring Machine is operated by precision direct cam action. Because of the demand for this type of machine, a smaller model, the Ex-Cell-O Style 308, is now available.

Standardized Automatic Transmission

(*Continued from page* 61)

hydraulic fluid is circulated through the selectors, to cool the disks.

An industrial fork truck equipped with Hydratork drive has three simple controls: an accelerator, a brake pedal and the direction selector level. There is, of course, no conventional clutch or clutch pedal.

A number of economies were derived by Clark from the fact that the "Clarklift Line" was designed from the start as an integrated whole rather than model by model. One of the most important was the use of the same transmission for six different truck models. Seven different transmissions, four mechanical and three automatic, are needed for the equivalent machines in the standard line of Clark trucks.

A number of changes were made in the Clarklift Line Hydratork drive as compared with the original concept of the unit as introduced three years ago. For instance, drive capacity has been increased by 20 per cent, by adding another selector disk to the primary and secondary gear selector packs. This makes for safer operation and engaging and disengaging is more positive. At the same time, a new aircooled radiator was designed to provide greater cooling capacity for the hydraulic system that is common to both the torque converter and the transmission.

When the Hydratork drive was first manufactured, it was deemed obvious that a certain amount of routine maintenance and repair work would have to be done on the gears and selector disks. To make them readily accessible for servicing, the transmission case was split so that, by removing some bolts, the gears and selector disks were immediately exposed and easily removed. Three years' field experience disproved the obvious; the soundly conceived transmission rarely needed to be serviced. It was rather the auxiliaries, the hydraulic control valves and pump that needed periodic servicing. These field results are reflected in the new Clarklift production models. The transmission case is now an integral unit; and the hydraulic valves and pump are installed outside the transmission case where they are readily accessible.

In most cases, the 2.16-to 1 torque multiplication provided by the torque converter is more than adequate for satisfactory performance of the fork truck. There are cases, however, when operations and load characteristics make is desirable to have additional pulling power or gear reduction. This need is more likely to occur in heavier capacity, outdoor model trucks. In the case of the latter, a mechanical "creeper" gear provides 68 per cent more reduction. The operator shifts down mechanically if he wants to use the "creeper" gear.

The Clarklift Hydratork unit has particularly good inching characteristics as a result of a specially designed infinitely variable pressure regulator valve. This valve "modulates" the flow of hydraulic fluid to the clutch packs of the primary and secondary gears. By slowly depressing the brake pedal, the hydraulic system oil pressure is lowered, permitting the selector plates to slip to a limited degree. The hydraulic pressure, and thus the truck speed, can be reduced in an almost infinite number of increments—and held at each lower increment.

The pressure regulator control valve is connected to the brake pedal by a mechanical linkage, rather than hydraulically. When the brake pedal

Greater Magnetic Attraction . . .
More Efficient Design

Delpark Gravity Type High Capacity Low Velocity Flow
Magnetic Separator

A new, more efficient design with gravity flow over an enormous, fully concentrated flat magnetic field to give the greatest, most efficient separation of ferrous sludge and abrasives from liquid.

- Greatest concentration of Alnico #5 Permanent Magnets.
- Most powerful magnetic field.
- Magnetic field doubled in width.
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- Constant sludge removal by chain driven flights.
- Self Cleaning — Fully Automatic.

Delpark Magnetic Separators are available with adjustable legs, with dragout in tank, with collector tank or without tank. They are also used in combination with the famous Delpark Disposable media filter.

Delpark . . . first in filtration advancements

Write for more complete information

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Anaconda specifies Enjay Butyl rubber

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for more current per circuit... more power per dollar

Anaconda specifies Enjay Butyl insulation for high-voltage cables because this rubber has incredible resistance to ozone. Surpassing the industry's standard three-hour specification test, Enjay Butyl insulation used by Anaconda showed *no injury after 72 hours* of ozone concentration tests—24 times longer than specification requirements. Other rubbers would deteriorate and crack in a fraction of this time.

With the help of Enjay Butyl, millions of feet of Anaconda's cable now in use deliver more current per circuit, more power per dollar.

Perhaps *your* product, too, can be improved with versatile Enjay Butyl. It comes in non-staining grades for white and light-colored parts, offers excellent electrical properties, low price and *immediate availability*. For full information, contact the Enjay Company. Complete laboratory facilities and technical assistance are at your service.

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Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

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PROVIDES THE *PUSH*

BEHIND THE PUSH BUTTONS

Photos courtesy Herring-Hall-Marvin Safe Company, Hamilton, Ohio

TUTHILL MODEL OOL

Powers Electro-Hydraulic Control On Automatic Vault Doors

In step with today's automatic age, this unique bank vault door operates by push-button control. To power the electro-hydraulic mechanism that controls this automatic opening and closing operation as well as lowering and raising the foot bridge, H-H-M engineers selected the Tuthill Model OOL, known the world over for its dependable performance.

The dependability so essential for applications like this is engineered into the Tuthill Model OOL. Vertical ports maintain its prime. The mechanical seal contributes to quiet, leak-free performance and low power consumption. Precision manufacture assures constant delivery of capacity required. And as a final guarantee of performance, every Tuthill unit is subjected to the most exhaustive tests before shipment—to make them extra safe for safe service.

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Chicago 19, Illinois

Write today for complete data on Tuthill pumps for hydraulic service.

See our catalog in Sweet's Product Design File 6b-Tu.

Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

is depressed beyond a certain point, the link between the brake pedal and the valve is disengaged, and the valve cuts off the flow of hydraulic fluid to the selector packs. The power train is now in absolute neutral and the engine can be raced without truck creep. This is an important characteristic since a truck operator must frequently race the engine to speed up the raising or lowering of the forks or the actuation of an attachment, while keeping the truck at a standstill.

Since machine dimensions vary as between a 1000 and 4000 lb capacity truck, a means had to be devised whereby the same transmission could be fitted into the various truck models. This was done by the design of a new, three-piece drive axle.

In the Clarklift Line, the load carrying member, i.e., the drive axle, is essentially integral with the transmission. Specifically, the center section of what would be a standard drive axle, is designed as part of the transmission and is the same for the six truck models. The differential carrier is completely sealed and does not require lubrication.

To complete the drive axle, two axle ends are bolted to the center section. The axle ends consist of two shafts, one a right-hand and one a left-hand shaft, on which the wheels are mounted. A secondary reduction is provided at each drive wheel by means of planetary gearing. Torque flows from the transmission through the ring gear which turns the center section of the drive shaft and, in turn, the drive shaft ends. Integral with the drive shaft ends are pinions which drive internal gears connected to the wheel hubs. These internal gears are in a completely sealed unit and run in oil—so no lubrication is required.

The brakes have been moved from inside the wheels and are located on the drive shaft ends. This arrangement permits the use of a compact, 8-inch brake unit whose efficiency is increased through the gear reduction at the wheels. The brakes are of the self-adjusting type — known in the automobile field but new in the fork truck field. A compensator pin maintains a pre-determined clearance between the lining and the drum every time the brake is applied. When the lining is ready for replacement, the pedal moves to a low position when depressed.

In addition to the Hydratork Drive, current automotive trends are reflected in the Clarklift Line by the inclusion of a 12-volt electrical system and tubeless pneumatic tires.

Whether it's CRASH HELMETS OR TOTE BOXES

KEY-TOPS OR TRAYS – DRIP PANS OR PUSH BUTTONS . . .

AMERICAN IS YOUR ANSWER

FOR PRECISION MADE PLASTIC PARTS

Whatever your industry or plastic part requirements, American's your answer. One of the nation's oldest and largest manufacturers of plastics, American offers facilities for injection, compression, extrusion, double-shot injection molding and low pressure and vacuum assisted molding. American's ultra-modern equipment can mold most types of plastics, including cellulose acetate and butyrate, polystyrene, acrylics, reinforced fibreglass and copolymers. American's giant plant can handle every stage of manufacture from design to mass production. Regardless of whether your plastic problem is clear-cut or complex . . . regardless whether your needs are small or large, call upon American for the economical, quality answer. Write direct for further information today. Address Dept. A

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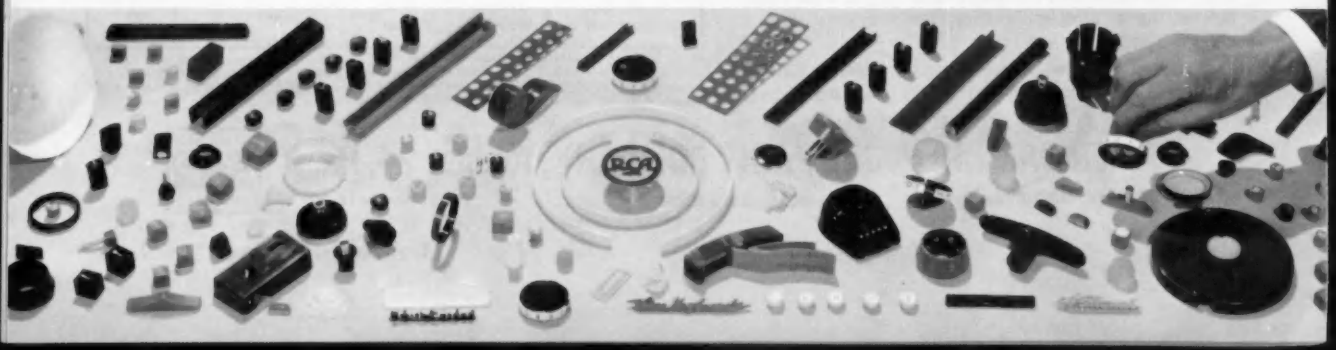
A Subsidiary of Heyden Chemical Corporation

EXECUTIVE OFFICES: 342 MADISON AVENUE, NEW YORK 17, N. Y.

Plastics Production Partner of America's Most Progressive Manufacturers



Is your part illustrated? These are representative of the shapes that can be cold formed more effectively with Granodraw.

GRANODRAW® PROCESS INCREASES TOOL LIFE 2-5 TIMES IN COLD HEADING STEEL FASTENERS

Thorough research, in cooperation with a leading manufacturer of headed fasteners, has proved the value of Granodraw phosphate coating of stock prior to cold working. Typical of the improvement in tool life and in production are the examples shown in the table.

But the advantages do not stop here in cold heading fasteners or cold working other products. This chemical treatment process permits greater speed of draw; greater reductions within the physical limits of the metal; more passes with the same number of intermediate treatments; and the possibility of fewer process anneals. It also results in less downtime of machines, better surface finish on products, cold forming of more complex shapes, fewer rejects, and a cleaner shop.

Write us for complete information about Granodraw and its application in cold forming operations.

PRODUCTION AND TOOL LIFE

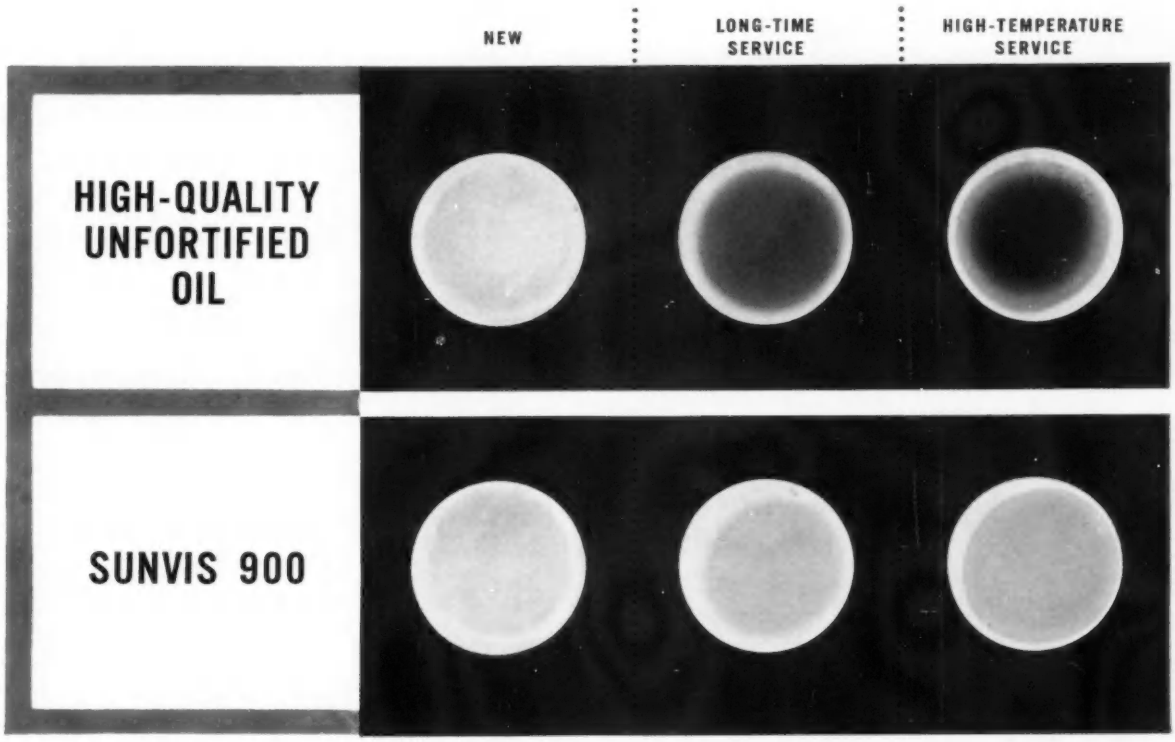
PRODUCT	MATERIAL		AV. PIECES PER DIE DRESSING	
	Tool	Stock	Granodraw-Treated	Other Treatment
⅜ x ⅞ rivet	Hardened Alloy Steel	1010 Steel	647,000	180,500
5/16 x 24 flat head shoulder bolt	Hardened Alloy Steel	1010 Steel	26,000	5000-8000
Hex Head Cap Screws	Hardened Alloy Steel	1038 Steel	53,000	13,000-14,000
¼ x 20 Hex Machine Bolt	Hardened Alloy Steel	1018 Steel	28,000	13,000

Note. Although investigations on the life of carbide tools are not completed, one item deserves mention. A 5/16 x 24 hex head shoulder bolt showed a strikingly low carbide tool life of 67,000 pieces per die. Using Granodraw-treated rod, one die produced 105,000 pieces—another 194,000 pieces. And both dies were in good condition at the end of the run.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 24, Pa.

DETROIT, MICHIGAN NILES, CALIFORNIA WINDSOR, ONTARIO

CHEMICALS ACP PROCESSES



Oil color tests show

WHY SUNVIS 900 OILS SAVE YOU MONEY IN CIRCULATING AND HYDRAULIC SYSTEMS

Color means very little in brand new oils. But...color *change* during service can mean a lot. While minor darkening is seldom serious, radical color changes indicate danger, except, perhaps, in a highly detergent oil.

Either the oil is contaminated by foreign matter, or as in the pictures, the oil has oxidized from heat and long use. The products of oxidation darken the color of ordinary oils...clog valves and filters, cause excessive maintenance.

Compare the appearance of the used Sunvis 900 with the appearance of the other used oil. The color of used Sunvis 900 is practically the same as new Sunvis 900. There is not a sign of oxidation products.

Here's proof that Sunvis 900 oils will last longer and provide the extra needed resistance against the high temperature "hot-spots" of typical hydraulic and circulating systems. *For the long run, a Sunvis 900 oil is the most economical oil you can buy.*

For more information about Sunvis 900 oils, see your Sun representative, or write for Technical Bulletin 35. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-31.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

Philadelphia 3, Pa.

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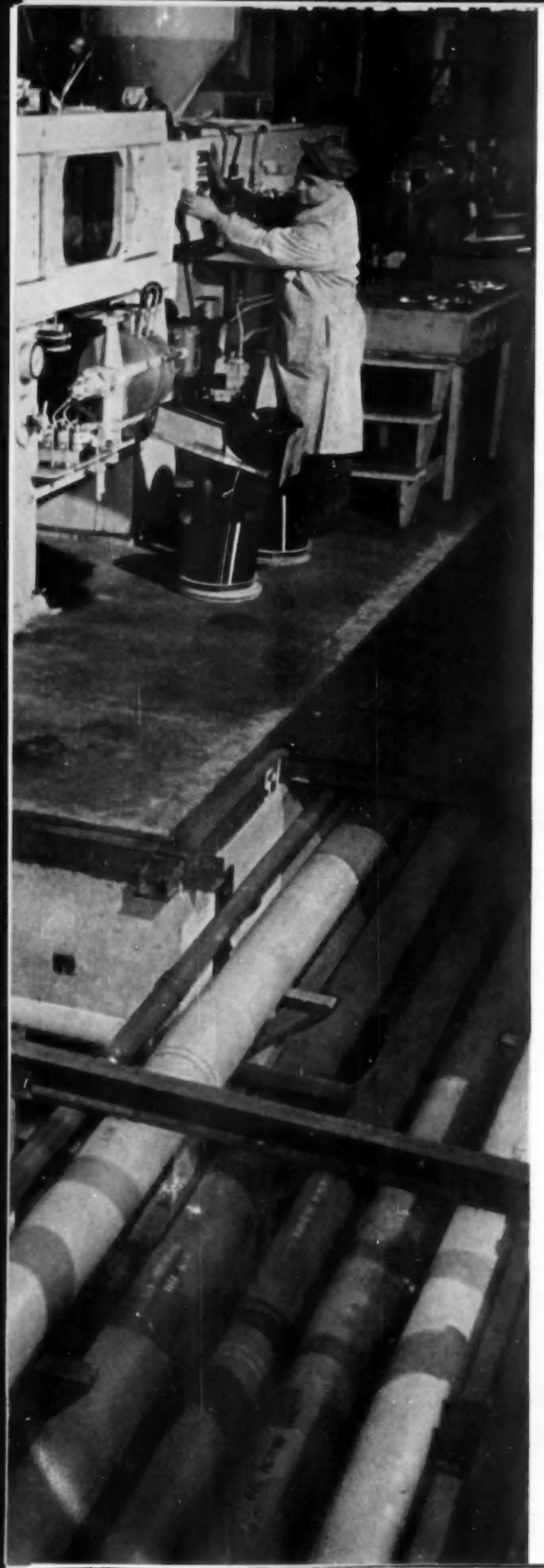
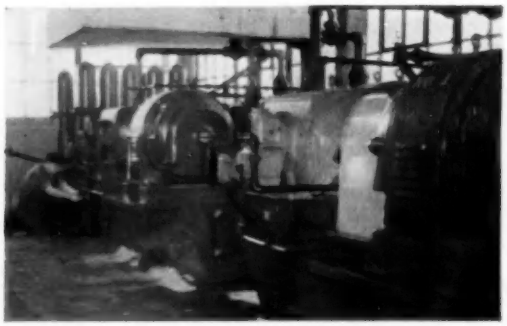
In Canada: Sun Oil Company Limited, Toronto and Montreal

SUNOCO®



High-Pressure Pumps, below, each handle 54 gpm of Sunvis 931 at 2500 psi. Unique closed-loop hydraulic system, left, features color-coded piping.



NEW CENTRAL HYDRAULIC SYSTEM PROTECTED BY SUNVIS 931 OIL

The new variable-pressure hydraulic system at Columbia Records in Bridgeport, Conn., delivers oil at 2500 psi to as many as 40 injection molding machines. Round-the-clock production of micro-groove records depends on the reliability of this system.

Columbia picked Sunvis 931 because their tests and experience have shown it doesn't form carbon or leave harmful deposits...even after years of use. Because of their long life, Sunvis 900 oils are the least expensive oils you can buy for tight circulating systems.

This is just part of the story about Sunvis 900 oils. Why not talk them over with your Sun representative the next time he calls. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-32.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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Philadelphia 3, Pa.

In Canada: Sun Oil Company Limited, Toronto and Montreal

Companies handling military contracts on a cost-reimbursement basis will have to hold up their claims for overhead rates until after the close of the contract period. Defense Dept. recently made this new policy change.

Office of Defense Mobilization is relaxing slightly its decision last year to shut off further rapid tax amortization under 25 industry expansion goals. ODM now will consider granting fast tax write-offs to concerns which had applications on file when the 25 goals were closed last September 29.

Construction of a $7.5 million atomic reactor station where materials for nuclear-powered aircraft will be tested will begin at the Wright Air Development Center in June.

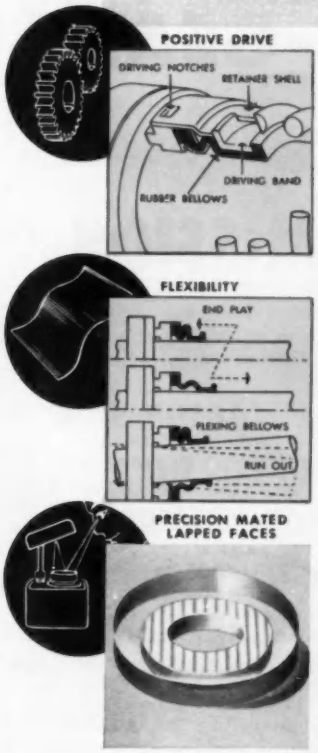
Air Force has just released three studies on the effects of various production elements on the properties of titanium and its alloys. Originally prepared for Wright Air Development Center, they are now available through Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.

Federal Reserve Board, which surveyed consumers on their spending and income plans early this year, says two-thirds of those questioned remain optimistic. It is reported that about eight per cent of all consumers plan to buy new cars this year, and another seven per cent expect to buy used cars.

Industrial companies, which are geared to keep their production going during an attack on the U.S., are asked by the government to take part voluntarily in the next national atomic alert exercise. This will take place July 20 to 26.

JOHN CRANE

Shaft Seal Design With A Purpose!



POSITIVE DRIVE

This gives long seal life. Drive is transmitted through the driving band and washer driving notch which absorb all breakout and running torque. Damaging stresses on the bellows or flexible sealing member are eliminated. Slippage is also eliminated, thus protecting shaft or sleeve against galling.

FLEXIBILITY

Axial and radial misalignment problems are eliminated. Self-adjusting bellows or sealing head automatically compensates for shaft end play or run out. Minimum spring pressure is required for axial shaft movement and uniform spring pressure is maintained during radial shaft movement.

PRECISION MANUFACTURE

Leakproof performance is assured. Washer and seat surfaces are precision lapped to a perfect mate under a patented "John Crane" process.

A SEAL FOR EVERY SERVICE

All "John Crane" Seals are constructed to the particular service requirements . . . from hot or cold water to the most destructive acids, corrosives and gases . . . temperatures up to 1000°F. . . . pressures to 1200 psi. They can be furnished in types and sizes to meet practically any mechanical or dimensional condition.

Request Bulletin S-204-2. Containing full information on "John Crane" engineered shaft seals.

GET COMPLETE DETAILS

Crane Packing Co.,
6433 Oakton Street,
Morton Grove, Ill.
(Chicago Suburb)

In Canada:
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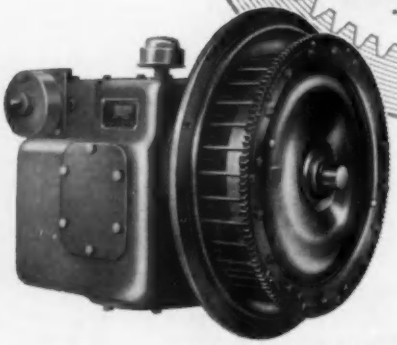
CRANE PACKING COMPANY

New PLAN-GEAR PGT TRANSMISSION

• PATENT PENDING •



the Transmission that's as simple to operate as an Electric Motor

• AMERICAN GEAR'S new **PGT** is a hydraulically operated, compound planetary transmission that provides a simple, versatile and extremely flexible means of power transmission.

• **PGT's** outstanding performance has been verified by complete tests in the laboratories of one of the country's leading Institutes of Technology.* It has been successfully used on earth movers, tractors, road rollers and similar equipment. Sturdily built, conservatively rated, **PGT** offers important advantages over more complex transmissions, including:

- Easily operated by anyone by merely moving a single hydraulic control lever
- Practically instantaneous (1.5 seconds) change of speed or direction without shifting gears
- Only one control valve lever for all speeds and neutral
- Utterly smooth...no shock...no jerk... no noise
- Cushion shift prevents shock loading, eliminates trouble
- Eliminates operator fatigue by eliminating clutch pedal
- Hydraulic control lever placed convenient to operator without regard to location of transmission
- Planetary gearing means considerably less length for comparable loads and speeds
- Positive pressure-fed lubrication to bearings and gears
- Two power take-off apertures can transmit up to one-third of engine output maximum

*Complete report on request

Write today ***for this new 8-page booklet which gives complete information, design details on all 7 models of PGT transmissions***

• 7 DIFFERENT MODELS • 85 OR 150 TO 200 LB. FT. TORQUE
1 OR 2 SPEEDS FORWARD • CHOICE OF REVERSE RATIOS

USE PGT TRANSMISSION ON

• Lift trucks • Earth movers • Hoists and cranes • Car pullers • Slushers Conveyors • Power take-offs • Front end loaders • Road rollers Other industrial equipment • Truck mixers

Designed and built exclusively by

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Subsidiary of BRAD FOOTE GEAR WORKS, INC., Cicero 50, Illinois

SHORTIES

About 80 per cent of motor vehicles are shipped from factories over the highways.

•

More than 60 per cent of public transit passengers in U. S. cities travel by motor coach. Some 8.9 million American children go to school by bus.

•

The average age of trucks in the nation is 6.6 years, compared with 5.6 years in 1941. One out of six trucks in use is a prewar model.

•

American industry will spend some $56.5 billion on research and development in the next 10 years.

•

It required 50 years for the U. S. to reach a total of one million traffic deaths in 1951. At the present rate, only half as long will be required to kill the second million.

•

The nation's trucking fleet, which now numbers 9.675 million vehicles and a seven-million-man working force, is expected to grow to 12 million vehicles by 1960.

•

By 1960, there are expected to be a million trailers on the highways and, by 1970, close to two million.

•

Twenty-three per cent of all installed power generating capacity 25 years from now is expected to be atomic.

•

Some 77 per cent of the nation's freight is transported over the streets and roads of the U. S. by gasoline-powered motor vehicles.

•

Americans spend about $9 billion a year for automobile vacations. This figure includes all expenses such as gasoline, oil, hotels, and meals.

new LORD bonded rubber pivot joints never need lubrication

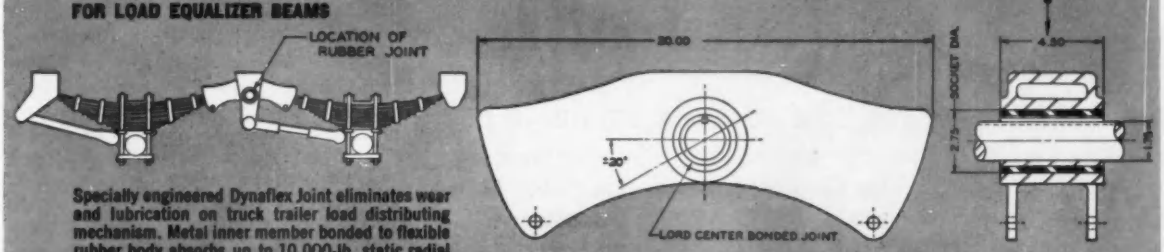
LORD DYNAFLEX® JOINT—a long-wearing, lubrication-free resilient bearing for pivots.

With LORD Dynaflex® Joints you have a new, better answer to problems on pivot joints. One that eliminates wear and lubrication . . . absorbs shock and reduces noise . . . assures mounting and alignment accuracy.

These new, high-capacity resilient bearings provide positive cushioned action—and accommodate static and dynamic radial loads encountered in heavy duty commercial vehicles, torsional deflections up to ± 30° and angular deflections up to ± 7°. Fatigue-defying flexing elements are specially compounded rubber, permanently LORD-bonded to steel members. Design is simple and compact, requires no close tolerances, and usually will fit present equipment with little or no change in mating parts. No metal rubs against metal.

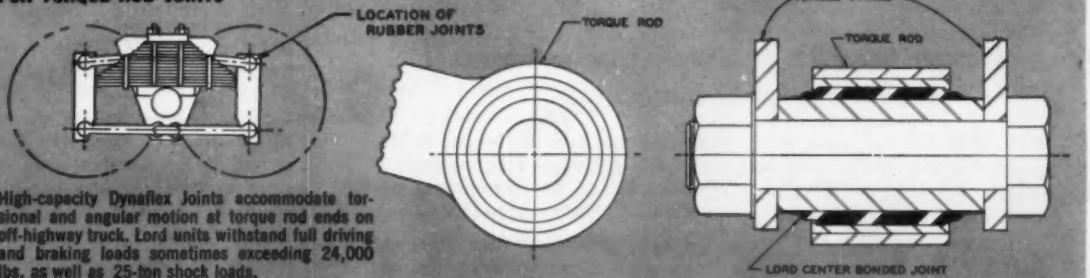
Bonded rubber Dynaflex Joints are the product of LORD development engineers who can produce special designs to solve your specific pivot point application. For further information, contact your nearest LORD Field Engineer or write the Home Office, Erie, Pa., for Bulletin No. 703.

FOR LOAD EQUALIZER BEAMS



Specially engineered Dynaflex Joint eliminates wear and lubrication on truck trailer load distributing mechanism. Metal inner member bonded to flexible rubber body absorbs up to 10,000-lb. static radial load and torsional deflection of ± 20°.

FOR TORQUE ROD JOINTS



High-capacity Dynaflex Joints accommodate torsional and angular motion at torque rod ends on off-highway truck. Lord units withstand full driving and braking loads sometimes exceeding 24,000 lbs. as well as 25-ton shock loads.

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LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA

LORD BONDED RUBBER

designers and producers of bonded rubber products since 1924

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NYLINED*

BEARINGS

...with Smooth, Tough, DuPont NYLON!

...OFFER YOU THESE IMPORTANT BENEFITS

- LOWER COST
- NO LUBRICATION
- MINIMUM SPACE
- CLOSE FIT
- RESIST POUNDOUT
- RESIST ABRASION
- RESIST CORROSION
- EASILY INSTALLED
- DAMP VIBRATION
- OPERATE IN LIQUIDS
- NO FRICTION OXIDATION
- LOW FRICTION
- SILENT
- LIGHTEST WEIGHT
- NON-CONTAMINATING
- LESS MAINTENANCE
- SELF-RETAINING
- INSTANTLY REPLACEABLE
- LONGER LIFE

Engineered to Solve Problems... Improve Products... Reduce Costs!

NYLINED Bearings are a highly engineered thin liner of Dupont Nylon, designed to bring bearing users the many benefits of Nylon as a bearing material by solving most of the limitations surrounding its use. The compensation gap principle assures maintenance of diametral tolerances for precision applications.

Available in 4 standard types, 10 standard sizes... from stock. Other types and sizes may be inexpensively tooled for production applications. For catalog containing data on advantages, applications, standard sizes, prices, special types, load ratings, engineering information, evaluation chart, installation methods ...write to

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THOMSON INDUSTRIES, Inc.

DEPT. 1, MANHASSET, NEW YORK

Also— —Manufacturers of BALL BUSHINGS... the Ball Bearing for Linear Motions

Canadian Plant

(*Continued from page* 65)

drawn through automatically operated louvers, passed through two sets of heating coils, are air washed, and through fiber-glass filters before entering the supply ducts. At each point of discharge in the paint shop the treated air is forced through still another set of filters. For supplying filtered air under proper pressure, each air supply room has two fans driven by a 50-hp motor supplying 75,000 cfm of treated air—a total of 1,200,000 cfm for the entire installation.

More recently, Chrysler placed in operation an extensive paint shop facility for the painting of fenders and other sheet metal. Sheet metal parts are prepared on the first floor, move up to the paint shop and traverse it on an over-head conveyor system. Sheet metal parts are routed first to the 160-ft, six-stage Bonderizing machine, then through a 160-ft drying oven.

Chassis parts that require only black enamel finish are put through a 40-ft Flo-Coat finish unit installed by R. C. Mahon. The conveyor moves in a loop to provide a 10-minute interval for salvagable active drip, then another interval of six minutes of inactive drip where the congealed drops are collected on paper on the floor for disposal. Then the parts enter an 80-ft long Flo-Coat drying oven where work is held at 450 F for 20 minutes.

Exterior sheet metal parts which are to be finished in color are handled in a normal sequence. It is noteworthy that both the prime coat and Ecoshine are applied automatically in electrostatic spray booths. The two booths installed here were erected by Newcomb - Detroit, the electrostatic equipment being supplied by the Ashdee Electrostatic Products Co., Homewood, Ill.

Separate spray booths are installed for inside and outside sealer coats, and for an outside surfacer coat. Similarly, two 80-ft long Moore Air Equipment drying ovens are employed respectively for sealer and surfacer drying, each one holding metal temperature to 275 F for 35 minutes.

Colored sheet metal is given a wet sanding before applying the final color coat. Following wet sanding, the parts go through a dry-off oven, through a masking line for two-tone parts, tack-off and the final color spray booth 75 ft long. Final color is baked in a special oven about 120 ft long where metal temperature is held at 250 F for 35 minutes.

Cleveland engineers were told long ago to start with the quality standards of the industry *and work up.*

The result is Cleveland's "Top Quality" that gives you a lot more for your standard and special fastener dollar:

Extra "Physicals" from revolutionary Cleveland-developed Kaufman *double extrusion* Process that cold forges cap screw from oversize wire, prepared under our own close metallurgical controls. *Result*—flow lines follow screw's contour, insuring strong crack-free heads, and threads with sturdy physical properties. Internal ductility is undisturbed, and screw has higher tensile and toughness.

Accurate Forming to extra-close tolerances, so they spin every time smoothly snugly into place . . . real cost saving on your production line! In-process and final inspection and testing guarantee quality.

Service? We maintain ship-at-once stocks of every kind and size we make. Ask your jobber for Clevelands, or check with us on production quantities. Write for current stock list.

The

CLEVELAND CAP SCREW

Company

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Originators of the Kaufman DOUBLE EXTRUSION Process

Production Techniques for the Continental Mark II

(*Continued from page* 57)

are being assembled in another area. The chassis is built up on a short, waist-high conveyor line, then moved into the Peters-Dalton spray booth for painting. This booth marks the start of the final car assembly line. At the body drop, near the start of the line, the frame is checked by means of the massive inspection fixture which is suspended overhead. The fixture is lowered to cover the section of the frame to which the body is bolted. When finally aligned, the fixture enables the operators to determine in advance the proper thickness of body shims required at each fastening.

Engines for the Continental Mark II are manufactured in Dearborn, where they are thoroughly tested and given an established dynamometer run. Similarly, the automatic transmissions, manufactured at Livonia, are inspected and tested and operated in a car before being shipped to the Continental plant.

Despite these preliminary inspections, after the transmission has been attached to the engine here, the assembly is presented for a test run as a unit in the special Nankervis dynamometer for a cycle of 38 minutes.

At the end of the assembly line, the cars come off in complete form except for the front seat assembly. This is left for later installation to protect the front compartment trim from damage during the road test and succeeding tune-up. Each car is taken off the assembly line by a skilled operator for a test run over the ½-mile track in the rear of the plant. Part of the track is fitted with railroad ties to make sure the car is thoroughly racked. This shows up any squeaks and rattles that ordinarily are not uncovered until the owner has put some miles on the car.

After this test run, the driver takes car back into the plant and is required to make all corrections and tinkering adjustments himself.

Innumerable individual inspections are made during the course of production to assure proper quality control. For example, each radio chassis is inspected in a special booth, using a Sun tester for the purpose. After the wiring harness has been installed in the body shell, each branch and lead is checked by means of a special portable test stand to locate shorts or pinched wires. Occasionally, the wiring harness is removed completely and replaced to forestall trouble later on.

After the car has been test run and accepted, it goes back over a paint inspection line where every noticeable nick or scratch is isolated, then refinished and baked. Then the front seat assembly is installed, the car washed and polished, and is ready to receive the protective covering prior to shipment.

Hardened and Ground Parts are our *Specialty*

This king pin is truly king-size: 8" long and weighs about 12 lbs. We machined it out of No. 3140-2⅞" bar steel. After heat treating, bearing surface was given the specified fine finish-grind to 2½" dia., +.000 —.001.

Parts like this are our specialty —we've been making them exclusively for the automobile industry for more than 40 years. Each year has added to our knowledge and skill in precise machining, scientifically-controlled heat treating and micro-finish grinding. Let us show you what we can do with one of your tough jobs. Write or wire.

Henry W. Brown
PRESIDENT

Experienced production on:
King Pins • Wheel Studs
Shackle Bolts • Shackle Pins
Brake Anchor Bolts
Countershafts • Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
5th-Wheel Rocker Shafts
Water Pump Shafts
... anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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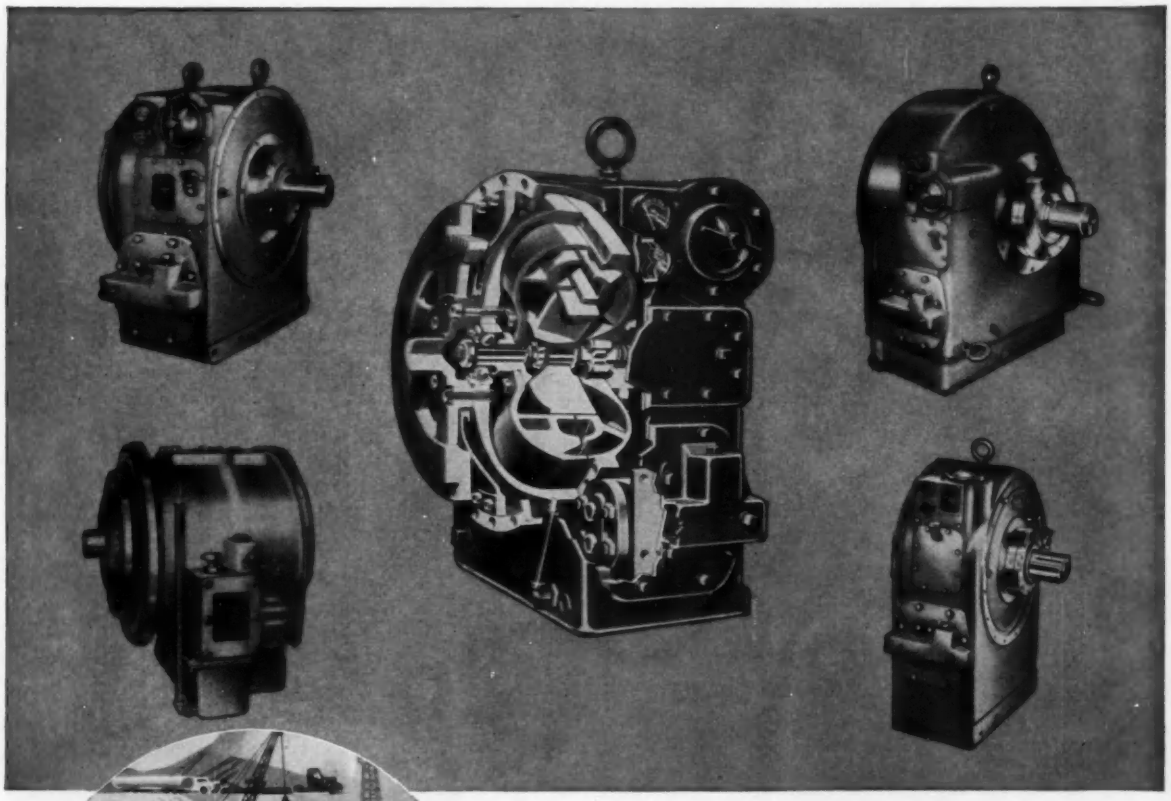


For your power need, *whatever it is,* there's a "right" TORCON Model

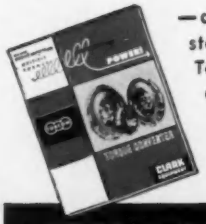
With a horsepower range from 15 to 600, and fly-wheel diameters from 11 to 26 inches, Torcon has a model that's right for your need—a standard unit available immediately for original equipment or for field installation.

Your real benefits begin after Torcon is installed—

- **more work and less wear: Torcon blade design balances engine efficiency and horsepower through the working range—smooth, shockless power that reduces wear, prolongs life**
- **integral unit includes oil pump, sump, pressure regulator; much better efficiency with minimum maintenance**

Are you constantly on the look-out for ways to get more efficient power at less cost? Talk to Clark—on all problems of power transmission, from flywheel to point of torque application. You'll find, as do many leading equipment manufacturers, that it's "good business to do business with Clark".

SEND FOR THIS TORCON BULLETIN



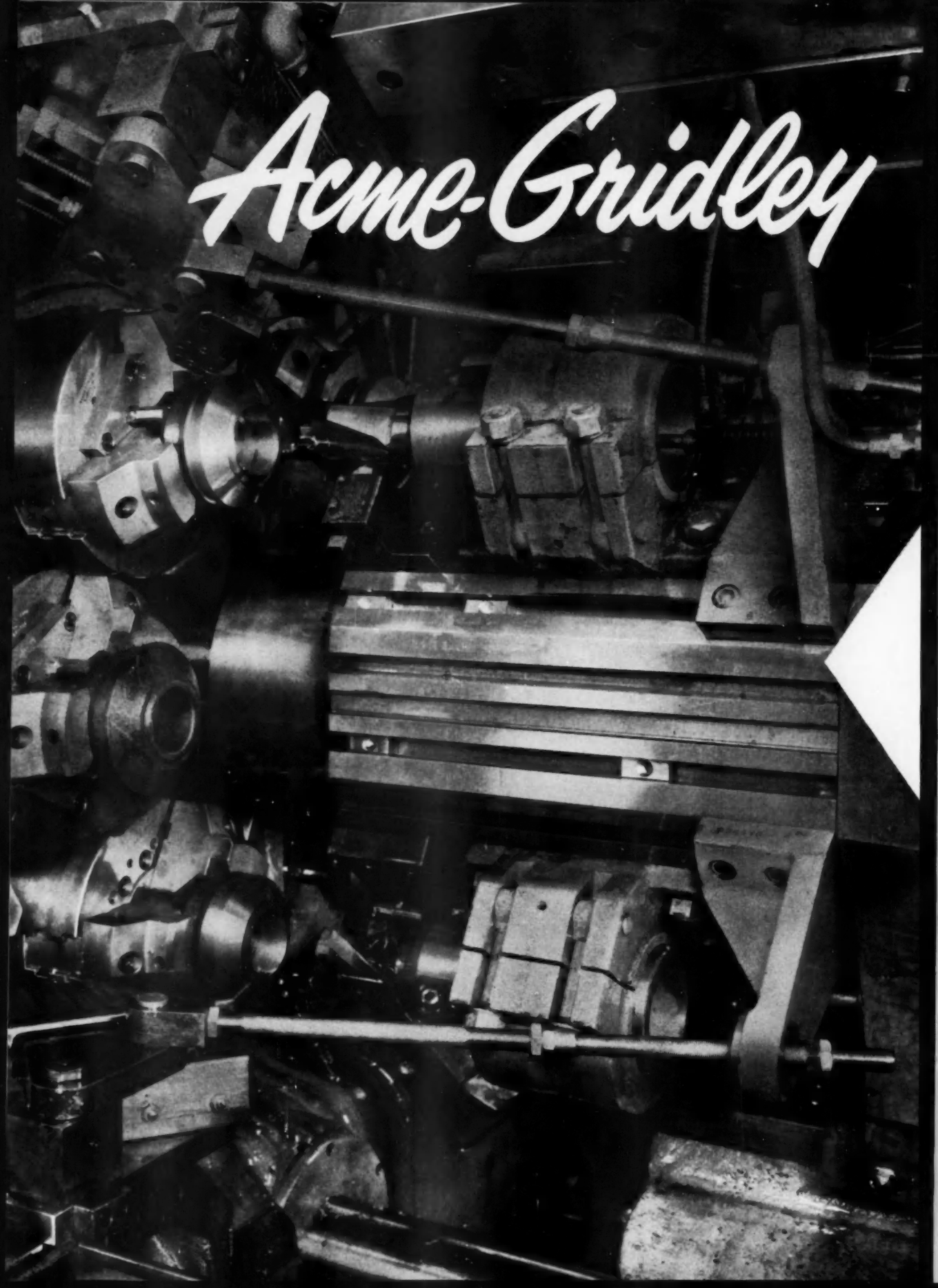
—a concise, helpful statement on how Torcon installations cut operating costs, prolong equipment life.

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY, Transmission Division

Falahee Road • Jackson 2, Michigan

Other Products of the Clark Automotive Division . . . TRANSMISSIONS • AXLE HOUSINGS • TRACTOR UNITS • TORCON TORQUE CONVERTERS • ELECTRIC STEEL CASTINGS • GEARS and FORGINGS • FRONT and REAR AXLES for TRUCKS, BUSES and OFF-HIGHWAY EQUIPMENT.


Acme-Gridley

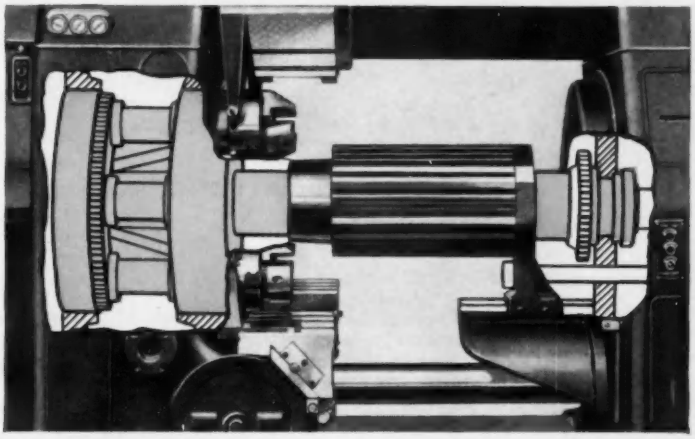
sound basic design

means greater production at lower cost

Accurate alignment of the tools and the work, every time the carrier indexes—and the rigid maintenance of this very precise alignment throughout every machining operation—provides greater precision all day long, less inspection, fewer rejects.

This accuracy resulting from sound basic design is one of the many reasons why Acme-Gridleys are setting new records for consistently accurate production every day.

- Spindle carrier integral with stem.
- End toolslide provided with bushings closely fitted to carrier stem and protected by front and rear seals.
- Toolslide further supported by rugged guide arm to heavy guide plate below carrier stem.
- Two wide spindle carrier bearings in headstock frame and a heavy-duty bearing in gear box provide maximum support.



LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

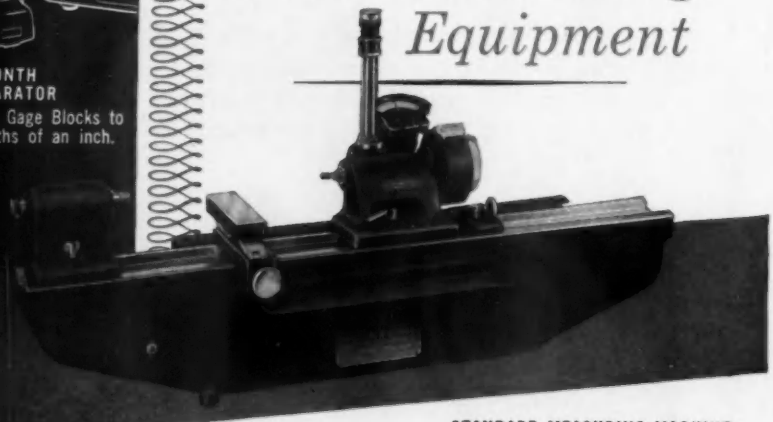
THE NATIONAL ACME COMPANY, 173 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

PRECISION GAGE BLOCKS
Basic master standards of measurement, accurate to millionths.

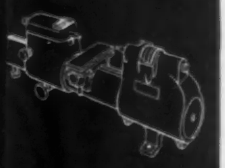
MILLIONTH COMPARATOR
Checks Gage Blocks to millionths of an inch.

To
Insure Quality
INSURE PRECISION
Use
PRATT & WHITNEY
Basic Measuring Equipment



STANDARD MEASURING MACHINE

ELECTROLIMIT UNIVERSAL INTERNAL COMPARATOR
Reads direct to .00002"



SUPERMICROMETER
Reads direct to .0001"

You'll have the best Quality-Insurance obtainable if you make it a policy to determine the *correct* degree of precision for *your* products and then maintain these limits . . . broad or close . . . dependably and accurately, year after year. And the *best* way to provide your plant with this *Basic Accuracy Protection* is by using Pratt & Whitney Basic Measuring Equipment as a constant check on the accuracy of your *working* gages.

The heart of Pratt & Whitney Quality Protection is the Standard Measuring Machine shown here. Reading direct to .00001", it's a basic unit for any Standards Room. Used with the other equipment shown, you'll underwrite Quality, insure Precision and receive lasting dividends.

Write, outlining your Quality Control requirements, for complete recommendations on Pratt & Whitney Basic Measuring Equipment to meet your needs.

PRATT & WHITNEY COMPANY
INCORPORATED
18 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities
MACHINE TOOLS • GAGES • CUTTING TOOLS

METALS

(*Continued from page* 96)

Short Nickel Supply

Of all the well-known metals, nickel is the hardest for the consumer to get. The scarcity is particularly serious for makers of stainless steel, which is now in heavy demand. Consumers without defense ratings have little chance to get all they need and are obliged to go to the gray markets where they have had to pay $1.50 to $3 per lb for limited supplies. Stainless steel users may have to swing over to non-nickel grades unless the Government loosens up on its demand for about 40 per cent of the supply for defense purposes.

However, some relief is in sight. Diversion of 18 million lb for civilian industrial uses in the second quarter was authorized by the Office of Defense Mobilization. In addition, 500,000 lb a month from the Government's Nicaro production will be continued.

In an effort to overcome the nickel shortage, stainless producers have been pushing the "400" series for nickel-free straight chromium stainless steels. Although these steels account for about 40 per cent of the stainless tonnage, they are not entirely satisfactory as a substitute. To encourage their use, one producer has reduced the price $45 a ton to $690.

Nickel Price May Rise

The nickel price could easily be raised above the present offered quotation of 64½ cents per lb, but it wouldn't bring out another pound of nickel. Yet such a move cannot be ruled out, and with other metals riding the inflationary wave, the chances are that nickel will sooner or later be forced to join the parade. It would have happened earlier if the leading producer, International Nickel, had been willing, but officials of the company have repeatedly stated that the best interests of their industry are served by maintaining a stable price as long as it is within their power.

Copper Price Declines In London

London prices for copper, after reaching 54½ cents per lb, dropped precipitately by mid-April to less than 48 cents, an 11 per cent decline. It appears that the peak was definitely reached in March, and it is unlikely that the 54-cent price will be seen again. Special efforts made by the British Government to bring prices

saves fuel and boosts engine horsepower

Warner designers are working with manufacturers of internal combustion engines to supply custom-engineered *electric* fan clutches which reduce fuel consumption and increase engine horsepower. These small, low-cost Warner Electric Clutches disengage the radiator fan of automobiles, trucks, buses, or stationary engines when cooling is not required, and re-engage the fan when necessary. The electro-magnetic principle permits cycling the fan *on* and *off* by means of a thermostatic control.

It's a simple, trouble-free system that can add powerful new sales features to your product, including faster warmup, easier starting in cold weather, reduction of engine noise and sludging, increased horsepower, and considerable reduction in fuel consumption. These clutches are designed to your specific requirements and produced by methods geared to the needs of large-quantity users. Use the coupon below to get complete information and test data.

WARNER

Beat competition with

ELECTRIC BRAKES AND CLUTCHES

Warner Electric Brake & Clutch Co. • Beloit, Wisconsin

Warner Electric Brake & Clutch Co.
Dept. AI, Beloit, Wisconsin

Write for new Warner "Technical Report" on Radiator Fan Clutches.

Name_____

Company Name_____

Address_____

City_____ Zone____ State_____

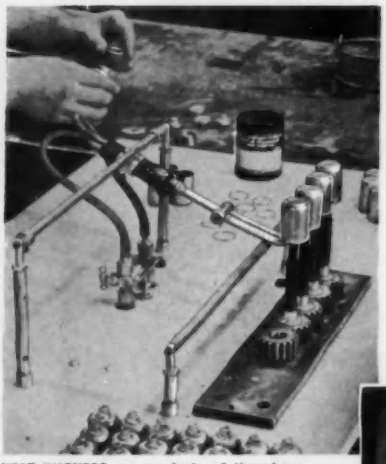
EASY-FLO HELPS PUT DEPENDABILITY IN THIS "HEAT WARNER"

EASY-FLO 45 RING

This simple safety device is used on railroad bearing boxes and all kinds of machines and equipment to give warning when temperature rises to a danger point. It comes filled with an odorous gas or with smoke, under pressure, held in by an alloy plug that has a fusing temperature to fit the application.

It's made of a drawn brass shell and a brass screw machine made cap, brazed with EASY-FLO 45. This low-temperature silver brazing alloy is used because — *it naturally and consistently makes gas-tight joints* that have the properties to stay gas-tight permanently—namely—high strength with resistance to pressure, vibration, shocks, heat changes and corrosion equal to the metals joined. In addition, EASY-FLO 45 makes brazing an extremely simple, economical operation.

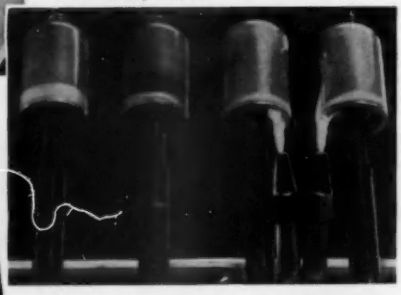
HOW'S THIS FOR FAST, EASY METAL JOINING



Above are the parts with ring of EASY-FLO 45 wire in place. At left —Operator applies HANDY FLUX*, puts shells over alloy ring and cap, sets assemblies, cap down, on geared spindles. Below—2 assemblies are brazed at a time on the slowly revolving spindles with double-tip torch — heating time, 12 seconds.

*Working at 1100°F, HANDY FLUX is a "must" to get full benefit of EASY-FLO 45's low flow point of 1145°F. Besides, it is unsurpassed as a dissolver and absorber of refractory oxides.

HEAT WARNERS are products of Humphrey-Wilkinson, Inc. Chemical Manufacturers of North Haven, Conn. Equipment by Specialty Brazing Laboratory, Riverside, Conn.



WELDING SHOW

BUFFALO, N. Y.-MAY 9-11

SEE a production brazing job in actual operation. Also many other examples of EASY-FLO brazed parts. TALK to our engineers about your brazing problems. BOOTH 39

READ ALL ABOUT EASY-FLO BRAZING IN BULLETIN 20 . . .
Write for a copy today.

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

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MONTREAL, CANADA

down have had their effect on the London Metal Exchange.

In our own markets the custom smelters cut their prices to 50 cents per lb. April delivery was selling earlier at 55 cents, and copper scrap sank to 41½ cents, from 45 cents.

Confusion in Copper Markets

The reason for the copper price decline is not too clear, especially in view of the fact that the established producer's price of 46 cents is firm. One thing is certain, however, consumers, both here and abroad, are no longer willing to pay premium prices.

Yet the March statistics from Copper Institute present a far from disturbing picture. Domestic production reached a new peak, as expected, with the huge San Manuel mine rapidly approaching its rated annual capacity of 70,000 tons. Domestic deliveries continued high at 141,600 tons and refined stocks on hand at the end of March totaled 51,600, or no more than 12 days' supply.

The figures for the industry outside the United States furnished a real surprise. Shipments to foreign fabricators rose sharply to 121,300 tons in March, highest for 1955-6. This astonishing recovery from February's sharp decline to 97,500 tons apparently contradicts the belief that European demand was declining.

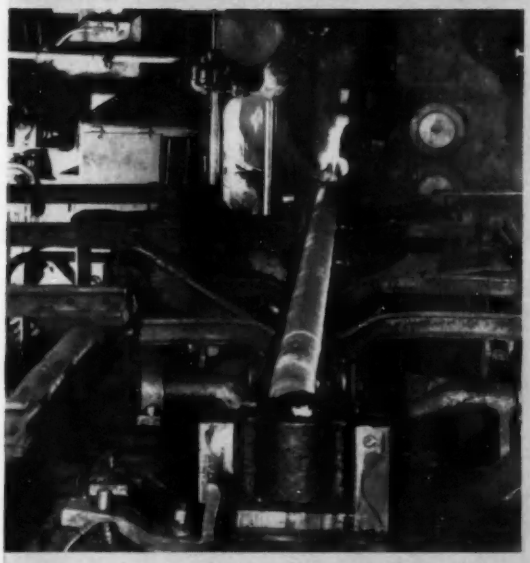
Chile Gets Higher Price

Copper still remains the unpredictable metal. In February there was a heavy decline in new orders booked by brass mills, wire mills, and foundries which involved the use of 44,000 less tons than were booked in January. In spite of this drop, Kennecott Copper Corp., which has gone on record as being opposed to the present high price level, nevertheless was obliged to advance the price at which it would sell its Chilean copper in deference to a directive of the Chilean Government. This price would be governed by the sales price on the London Metal Exchange, which has been substantially above the 46 cent price maintained by the American producers. The same policy was adopted earlier by the Anaconda Co. The fabricating subsidiaries of both companies have raised the base for their products to compensate for the higher price charged for Chilean copper.

The present multi-price system can remain as long as demand for copper is high, but all history shows it can have no permanency.

(*Turn to page* 126, *please*)

Jones & Laughlin UPSETS TUBING ON NATIONAL FORGING MACHINES!



Upsetting tubing on a National Forging Machine at the Jones & Laughlin Aliquippa Works.

Jones and Laughlin Steel Corporation, recognized outstanding experts on upset tubing as well as other forgings, rely upon National Forging Machines for this type of exacting work. At present on the job at the Aliquippa Works of J&L, are National 6″ and 7½″ Forging Machines. Their new 10″ National — the largest size upsetter being built today — will be scheduled to go into production soon.

Here is another example in which industry's leaders and National Machinery "team up" to solve difficult forging problems.

If you have a forging problem—large or small, hot or cold, ferrous or non-ferrous—we invite you to send us your samples or prints. Better yet, pay us a visit. *Let's approach tomorrow's new and better ways of forging metal parts in the light of methods and ideas which our people are already testing today!*

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Research in titanium reduction and annealing by Dr. E. W. Johnson, Advisory Metallurgist, developed this vacuum arc furnace for commercial use. The consumable sponge titanium electrode, shown, is reduced to a highly pure titanium ingot.

Expanded design engineering is supervised by R. W. Brown, Engineering Manager, for Westinghouse gas and electric furnaces and atmosphere generators. Additional engineering facilities handle induction heating equipment.

Launching a new Industrial Heating Division

L. R. HAGUE OF WESTINGHOUSE CARRIES NEW PROFIT OPPORTUNITIES TO CUSTOMERS

Big and growing opportunities in metal treating are creating a need for broader equipment know-how and service. The answer to these needs is being put before customers by L. R. Hague, Division Manager, in over 10,000 miles of introducing Westinghouse major new Industrial Heating Division.

Cadre of key men

"Westinghouse new organization grows around key men with careers in metallurgical processing," reports Hague. "Their experience expedites problem solving on all types of equipment . . . gas and electric furnaces, atmosphere generators and induction heating equipment applications. Some of these involve more than one type of heat-treating and many installations incorporate work-handling advantages for in-line production."

Turn-key contracts

Manufacturing and field service organizations have expanded, too. They integrate their planning with customer timetables for equipment installation. Full erection and supervision of start-ups are provided in what Westinghouse calls *turn-key* contracts.

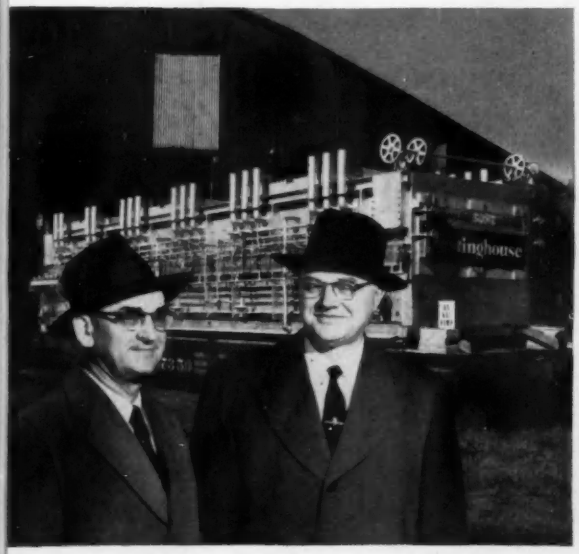
Research rapid

Hague points, in addition, to Westinghouse pioneering in new fields of metallurgy. "Developments in vacuum metallurgy, induction heating and other techniques are progressing rapidly," he said. "Equipment development is a part of Westinghouse large metallurgical research program."

On-the-spot planning

This year many plants plan heat-treating expansion. Many more will check heat-treating obsolescence—looking for troublemakers that cause extra handling, distortion, decarburization or scaling. "Call your local Westinghouse industrial heating sales engineer for counsel on these problems," Hague recommends. "He will bring broad equipment knowledge and service facilities for new profit opportunities." J-10449

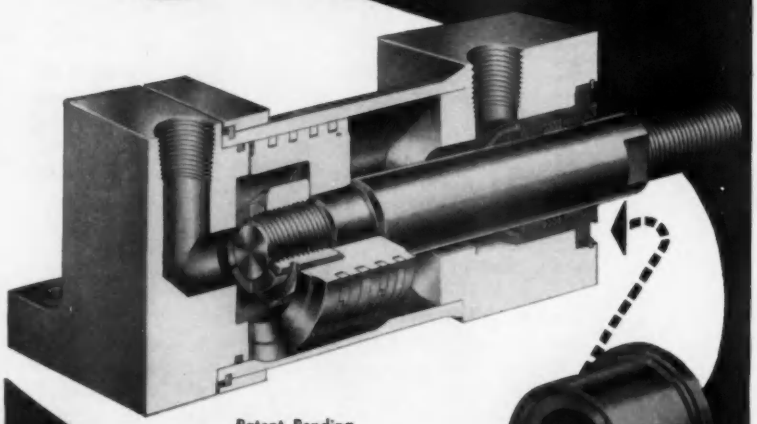
YOU CAN BE SURE...IF IT'S
Westinghouse



Project engineers, C. E. Peck and E. J. Seabold, work with Westinghouse customers in engineering, manufacture and installation of units such as this continuous annealing furnace, to be tested and ready to go in the customer's plant.

Industrial heating sales engineers are kept abreast of new developments and techniques in regular reviews with L. H. Gillette, Marketing Manager, and R. R. La Pelle, Furnace and Atmosphere Generator Application Manager.

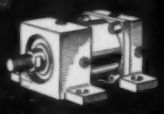
High Pressure HYDRAULIC CYLINDERS



Patent Pending

Cut downtime with "quick-change" rod packing cartridge

- 2,000 P.S.I.
- J. I. C. STANDARDS
- COMPACT DESIGN
- OPTIONAL ROD SIZES
- ALL-STEEL CONSTRUCTION
- 11 TYPES OF MOUNTINGS
- 11 BORE SIZES—1½" TO 8"
- UP-TO-DATE ENGINEERING



The S-P "quick-change" packing cartridge is easily removed for servicing seal or wiper. *Cuts downtime . . . speeds production.* S-P Hydraulic Cylinders have *every* modern design feature. Representatives in principal cities. Prompt deliveries. Send for Catalog 104. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916

AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

METALS

(*Continued from page* 122)

Aluminum Higher

The first industry-wide increase in aluminum prices since last August occurred when Reynolds Metals announced a 1½ cent per lb increase for primary aluminum, bringing the price of pig to 24 cents and ingot to 25.9 cents. The increase was promptly followed by others of the Big Three.

In defense of the move, industry spokesmen pointed out that financing new capital had become increasingly difficult because aluminum prices had lagged far behind the cost of new plants, raw materials prices, and freight rates. It is not on record that copper producers greeted the price increase for aluminum with cheers, but it may be suspected that they did. To some extent it lessens competition from the light metal.

BOOKS . . .

1956 WORLD-WIDE AUTOMOTIVE YEARBOOK, *by the Editors of Motor Trend, published by Trend, Inc., 5959 Hollywood Blvd., Los Angeles 28, Calif. Price, $.75.* A handy and readable guide to all production model cars of all nations, with separate sections devoted to passenger cars, sports cars, station wagons, and the so-called mini-cars. Each car is illustrated and the accompanying text contains a description of the car's principal features. In addition, a facts and figures section lists cars by country and gives their bore and stroke, displacement, compression ratios, speed, transmission type, wheelbase, height, width, turning circle, type of brakes, weight, and, when available, cost at factory.

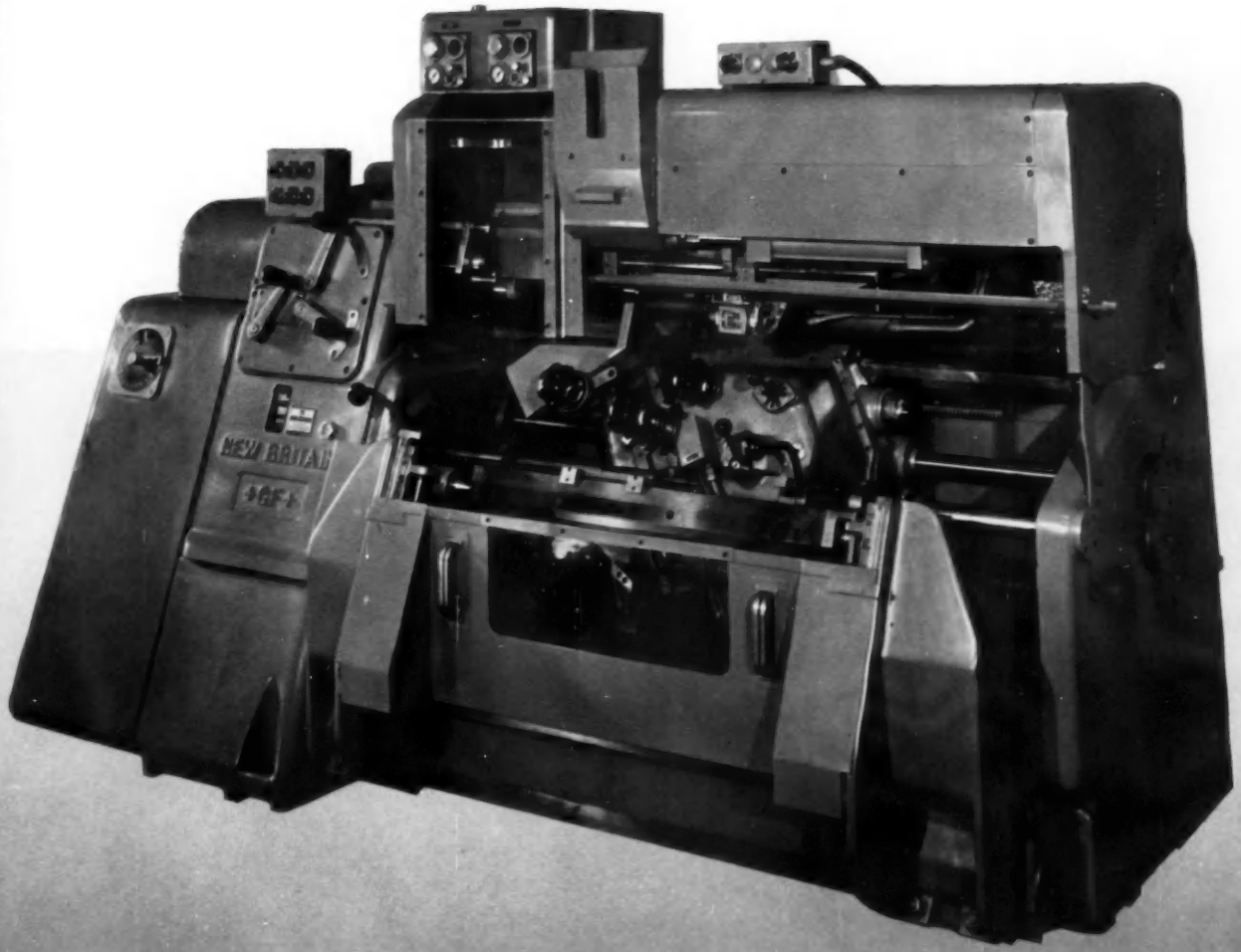
BEARING LUBRICATION ANALYSIS, *by Robert E. Slaymaker, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $5.00.* Dealing primarily with sleeve bearings, this new book also goes into the general principles of bearing design. The author's treatment is broad enough to enable the design of bearings in simple cases, or the handling of important preliminary plans for more complex applications. Among the features of the book are an outline of hydrodynamic theory as a guide to the design of bearings lubricated from an external source, a discussion of the characteristics of various bearing materials, and an analysis of oilless bearings.

INSTRUMENTS FOR MEASUREMENT AND CONTROL, *by Werner G. Holzbock, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $10.00.* This book describes and illustrates recent devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. In non-mathematical language, it discusses the design, construction and operation of instruments, shows how various instruments compare with each other, and points out the factors to consider in choosing the proper instrument for a particular requirement.

old methods can't compete

If you do *any* turning you should investigate the New Britain **+GF+** line of copy turning lathes—whether your work calls for sustained production or short runs demanding quick setups. It turns tapers and complicated contours with the same setup used for simple O.D.'s. No need for expensive form tools. Let us demonstrate this completely different approach to turning in a color motion picture demonstration at your desk.

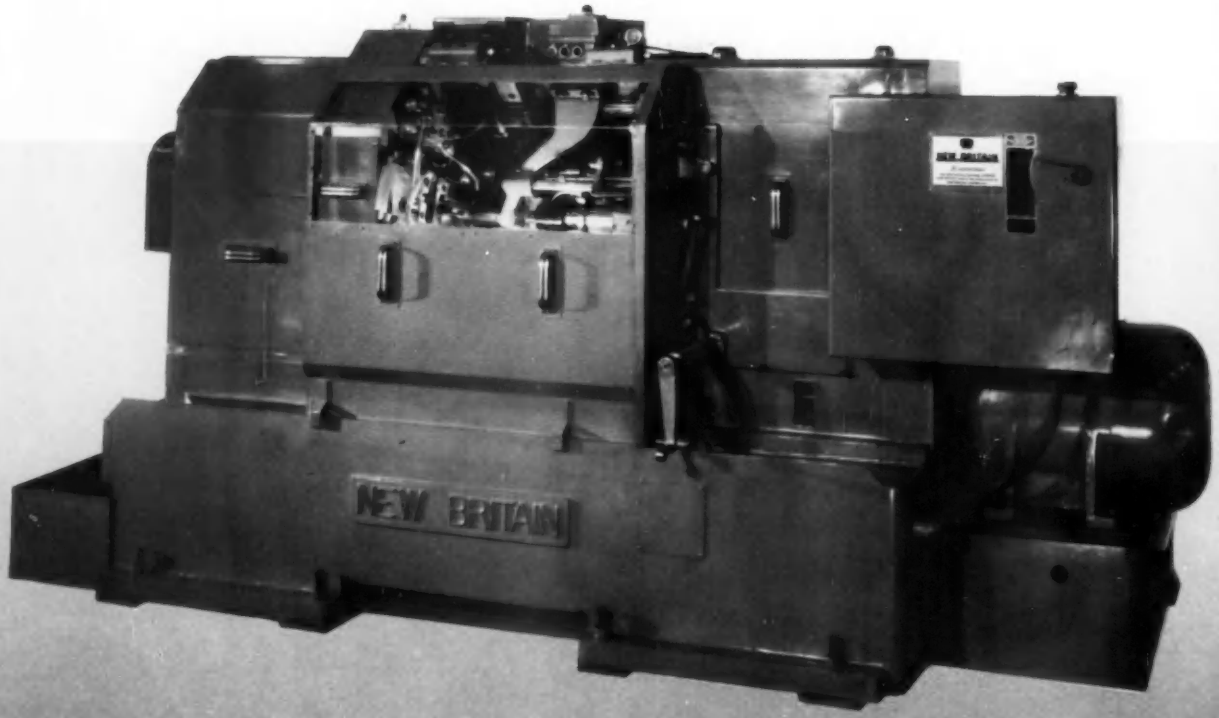
THE NEW BRITAIN MACHINE CO.
Model 11/70
New Britain +GF+
Copying Lathe
NB



a long new step forward in bar machine productivity

THE NEW BRITAIN MACHINE CO.
Model 62
Automatic Bar
Machine
NB

Here is a new New Britain bar machine with the ruggedness, power, speed and versatility to shed new light on your profit picture. Where you have bar work that now requires more than one machine, it may be practical to eliminate costly finishing operations by doing the whole job on a New Britain Model 62. Ask your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



XV

This is the fifteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Boron and Its Effects in Alloy Steels

Boron is a nonmetallic element of which this country has a plentiful supply. In its natural or unprocessed state it occurs only in combination, as in borax, etc. Pure boron is a gray, extremely hard solid with a melting point in excess of 4000 deg F.

This element is used in steel for one purpose only—to increase hardenability; that is, to increase the depth to which the steel will harden when quenched. Its effective use is limited to sections whose size and shape permit of liquid quenching. Only a few thousandths of 1 pct is ordinarily added, and boron steels are evaluated by increased hardenability rather than chemical content. A number of alloys, including several grades of ferroboron, are available for adding boron to steel.

Boron intensifies the hardenability characteristics of other elements present in the steel. It makes possible a considerable degree of alloy conservation when used with steels containing small amounts of alloying elements. However, since it readily oxidizes at high temperatures, some steelmakers prefer a melt with relatively low boron content and relatively high contents of other elements that protect the boron from oxidation.

It should be noted that boron is very effective when used with low-carbon alloy steels; but its effect is reduced as the carbon increases. When the carbon content is above 0.60 pct, the use of boron is not suggested, the exception being the "case" in those steels that are carburized.

Boron steels often require closer temperature control in heat-treatment than do some of the other alloy analyses; but aside from this they present no special problems. Their cold- and hot-working properties are considered at least equal to those of ordinary alloy steels. In cases where boron makes possible a lower alloy content, improved machinability frequently results.

If you would like to know more about boron and its effects in alloy steels, you are invited to consult with Bethlehem's metallurgical staff. Our technicians will gladly give you all the information you need, and will work closely with you in every respect. And when it is time to replenish supplies of steel, remember that Bethlehem manufactures the full range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades.

If you would like a reprint of this advertisement, or of the entire series from I through XV, please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

GENERAL ELECTRIC ANNOUNCES . . .

NEW Industrial

Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

* Trade Mark of the General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

Metal Beauty that complements the *Finest*

It's Mar-Resistant, too!

RIGID-tex Metal with its textured surface and shimmering beauty is a perfect complement to the elegance and richness of fine fabrics. It lends itself to the creation of exquisite interiors. But even more important, it provides the designer with a material he can use in places where service is rough . . . a material that takes kicks and scuffs, yet always remains new looking.

RIGID-tex Metal has beauty that is ageless. And here's good news to designers. RIGID-tex Metal is available in any metal, any finish, any color, solid or perforated. There are more than 40 standard patterns from which to choose.

For a new look that stays permanently new — always specify RIGID-tex Metal.

RIGID-tex METAL IT'S RIGIDIZED®

See Sweet's Design File 1a/Ri or write us for more detailed information.

RIGIDIZED METALS CORPORATION

6715 OHIO STREET BUFFALO 2, N. Y.

Sales Representatives in Principal Cities

Industry News

(*Continued from page* 39)

Plant Teletype System Expanded By Chrysler

Chrysler Corp. has expanded its teletype system to speed communications among plants in the U. S. and Canada. The company has installed new equipment at 30 additional locations to bring to 50 the number of such communication points around the country.

Ford Division Builds One Millionth '56 Car

A milestone was reached last month by Ford Div. with the production of the one millionth 1956 car. The car, which also marked the 33,202,731st unit to be produced by Ford since the company was founded in 1903, was built at the division's Long Beach, Calif., plant.

Immense Array of Equipment Displayed at Packaging Show

Throngs of visitors, estimated to number over 25,000 persons witnessed last month a colorful panorama of progress in the U. S. $10 billion-a-year packaging industry in Atlantic City, N. J. The products of close to 400 exhibitors, occupying over three acres of floor space in the resort city's Convention Hall were shown at the American Management Association's Silver Anniversary Packaging Exposition.

Among the wealth of equipment displayed was a new electronic system of data handling presented by Toledo Scale Co. General Electric Co. was on hand with a selection of its timing devices, solenoids, general purpose relays, etc., while the Film Dept. of DuPont Co. demonstrated high speed wrapping with Mylar on automatic equipment. The Plastics Div. of Monsanto Chemical Co. introduced a new styrene molding compound with a marked degree of optical clarity. Connecticut Hard Rubber Co. came up with a new .013-in. pressure-sensitive Teflon tape.

The booth of the Reeves Pulley Co., Div. of Reliance Electric and Engineering Co., featured display units representative of the firm's line of variable speed products; Warner Electric Brake & Clutch Co. showed its range of electric clutches and brakes for the machinery equipment. Its complete power transmission service was the theme of the Link-Belt Co. display.

Among other exhibitors and products shown were: Goodyear Tire and Rubber Co., new film-paper lamination; Bakelite Co., polyethylene developments; Minnesota Mining & Manufacturing Co., various varieties of tapes; and Signode Steel Strapping Co., new power strapping tool.

The concurrent National Packaging Conference covered the packaging requirements of both industrial and consumer goods manufacturers. How Douglas Aircraft Co. handles the movement of light and heavy aircraft components in the plant was described by T. E. Mechem of the El Segundo Div.

The unusual problems involved in packaging and packing panoramic automotive windshields were reviewed by Melvin C. Koster of Libby-Owens-Ford Glass Co. A carefully engineered program for packaging engine parts for shipment to original equipment manufacturers was presented in a paper by John A. Newton and B. A. Cummings of the Valve Div., Thompson Products, Inc.

REO *selects* **CENTURY**

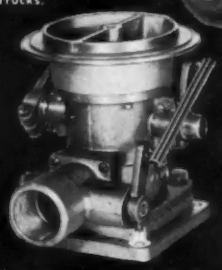
AS FACTORY STANDARD LP-GAS CARBURETION

Exclusively

on Super V-63 Cab-Over Model

REO TRUCKS

Four-barrel, down draft Century metering valve carburetor factory installed on Super V-63 Cab-Over Reo Trucks.



Dual throat, down draft Century metering valve carburetor now optional equipment on all Reo Trucks.

FOR PERFORMANCE

ONLY THE BEST is good enough for *Reo* Trucks . . . and Century LP-Gas Carburetors have proved best by every test, in both laboratory and road operation. That's why Reo selected Century 3C (controlled combustion) Carburetors as exclusive factory equipment on the Super V-63 Cab-Over Reo Trucks.

The big difference in the Century 3C is the metering valve, and it makes a big difference in engine performance. Why? Because the metering valve controls and proportions the gas to give perfect fuel-air mixtures at any throttle setting – starting, idling and full power – regardless of changes in temperature, altitude or pressure. No wonder Reo has joined the ever growing list of manufacturers who install Century Carburetion. *Write for literature today! Sales and service everywhere.*

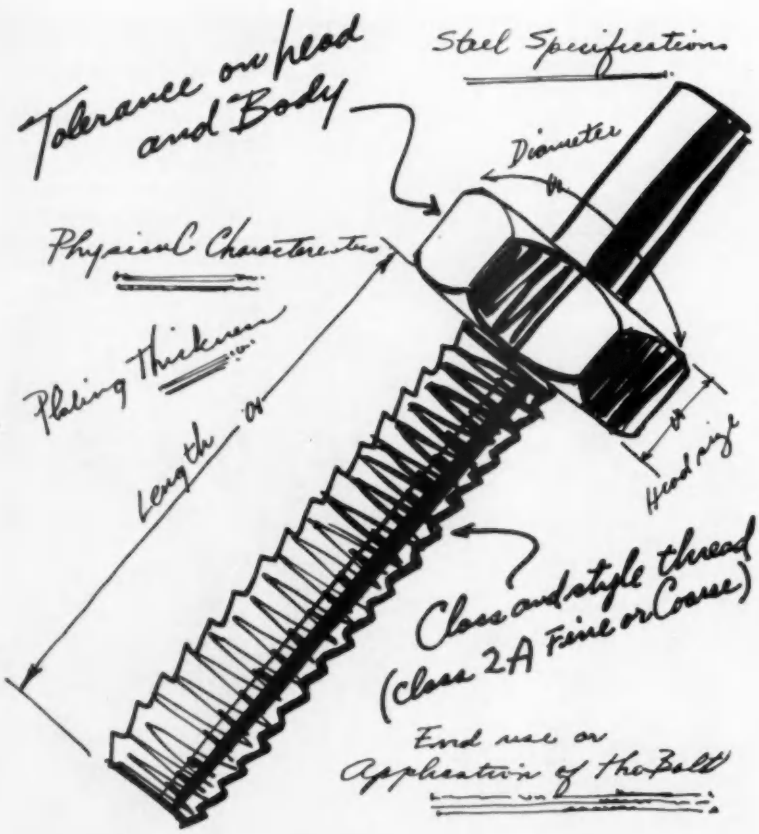
CENTURY GAS EQUIPMENT COMPANY

6855 East Rosecrans Blvd. • Paramount, California

UL 3C Controlled Combustion Carburetion

Set it!
Seal it!
Forget it!

CENTURY METERING VALVE LP-GAS CARBURETION



FROM A SKETCH

as rough as this...

Special fasteners that improved product design and function at reduced cost have often been engineered from ideas sketched on a pad. At Buffalo Bolt, experienced fastener designers welcome the opportunity of engineering your roughs into practical designs to do your intended job. Equally important, our production men know just how to produce them to meet your schedules.

Of course, we are always ready to quote on finished designs for specials, too.

EITHER WAY, you can be sure of fast, experienced cooperation when you call in Buffalo Bolt.

BUFFALO BOLT COMPANY
Division of Buffalo-Eclipse Corporation
NORTH TONAWANDA, N. Y.

● *3 convenient service centers*

WESTERN OFFICE	EASTERN OFFICE	CENTRAL OFFICE
Chicago	New York City	North Tonawanda
HArrison 7-2179	REctor 2-1888	JAckson 2400 (Buffalo)

Many **GOOD** *products can be made* **BETTER** *...with* **SPECIAL FASTENERS**

AI TABLOID

(Continued from page 37)

Hamilton Standard Div. of United Aircraft Corp. is setting up a new branch of operations for the engineering and development of specialized aircraft equipment at St. Petersburg, Fla.

* * *

Bohn Aluminum & Brass Corp. has purchased a one-story plant in Danville, Ill., for its new Betz Div. . . . Jack & Heintz, Inc., has purchased two plants in Bedford Heights, O.

* * *

Lake Erie Engineering Corp. has released a new color sound film entitled "Pressure on Extrusion Production."

* * *

Cummins Engine Co., Inc., is sending a unique Mobile Diesel Center to the field.

* * *

Ryan Aeronautical Co. holds a $12.5 million order from Boeing Airplane Co. for fuselage sections for the latter's 707 jet transport plane.

* * *

Bendix Products Div. of Bendix Aviation Corp. is launching a large power brake promotional program.

* * *

DuPont Co. plans to increase its construction expenditures to as much as $160 million to $170 million in 1956.

* * *

Los Angeles regional office of AUTOMOTIVE INDUSTRIES is now located at 4055 Wilshire Blvd., Los Angeles 5, Calif. . . . Society of the Plastics Industry is now located in its new offices at 250 Park Ave., New York 17, N. Y.

* * *

Janeway Engineering Co. is name of new concern established by Robert N. Janeway in the Machinery Bldg., 2832 E. Grand Blvd., Detroit 11, Mich. It will specialize in suspension design and development but plans to encompass all areas of applied dynamics.

* * *

Vickers, Inc., is expanding its aircraft activities through the opening of an office in the Wyatt Building, Washington, D. C.

With Daybrook Speedlift Power Gate, driver uses push button to lift 1100-pound loads in seconds. Lifting is done with hydraulic power furnished by PESCO Power Package which operates from automotive electrical system. Power Gates are manufactured by Daybrook Hydraulic Division, L. A. Young Spring & Wire Corp.

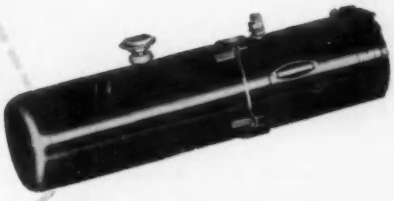
hydraulic power at the push of a button ...with self-contained Pesco package

If you need to produce hydraulic power from an electrical source, investigate PESCO's line of Hydraulic Power Packages.

These low-cost units are versatile and find extensive application on tailgate loaders, lift trucks, small dump bodies, farm tractors and snow plows. They provide hydraulic flow to .80 gpm at pressures to 2000 psi from any suitable 6, 12 or 24-volt d-c source.

PESCO Hydraulic Power Packages include an electric motor, hydraulic gear pump with integral relief valve, check valve and reservoir in a single, self-contained assembly. The PESCO gear pump features "Pressure Loaded"* bearings for higher volumetric efficiency and longer service life.

Original equipment manufacturers are invited to obtain price quotations or specific information from your nearest PESCO sales engineer or write: PESCO, 24700 North Miles Road, Bedford, Ohio.



PESCO HYDRAULIC POWER PACKAGE converts electrical power to hydraulic, finds wide industrial use. Compact "package" design contains motor-driven gear pump, relief and check valves and reservoir.

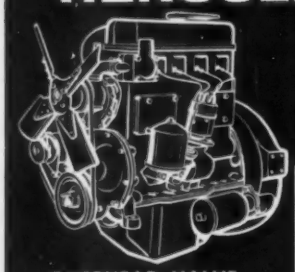
See our catalog in Sweet's Product Design File

**PESCO's patented principle of gear pump construction*

PESCO PRODUCTS DIVISION
BORG-WARNER CORPORATION
24700 NORTH MILES ROAD • BEDFORD, OHIO

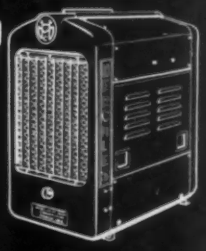
Producing the Best in Hydraulic Pumps, Fuel Pumps, Electric Motors and Axial Flow Blowers

HERCULES ENGINES . . .

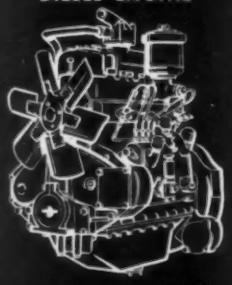


OVERHEAD VALVE GASOLINE ENGINE

CLOSED TYPE POWER UNIT

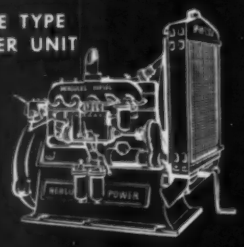


TURBULENCE CHAMBER DIESEL ENGINE

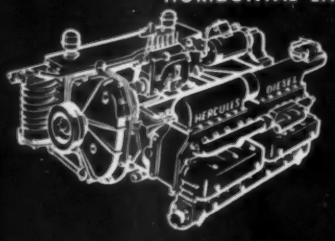


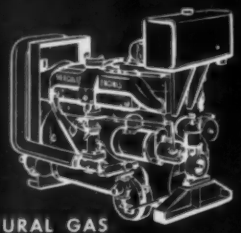
The complete line of engines and power units from 3 to 500 H. P.

BASE TYPE POWER UNIT

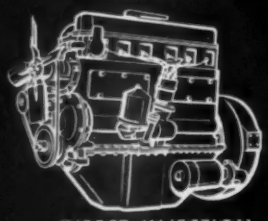


"PANCAKE" or HORIZONTAL ENGINE





NATURAL GAS L-HEAD ENGINE



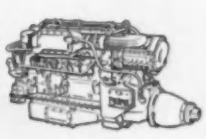
DIRECT INJECTION DIESEL ENGINE

The wide selection of engine types and sizes in the Hercules line, plus the flexibility of our production facilities provide a complete line of dependable power to meet the varied needs of many different industries.

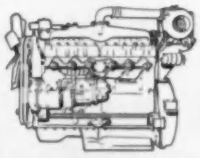
In addition to the various types of engines and power units illustrated, it is the policy of Hercules Motors Corporation to engineer and produce these engines to the specific requirements of each industry.

For assistance in solving your particular power problems, contact Hercules Motors Corporation—Engine Manufacturing Specialists since 1915.

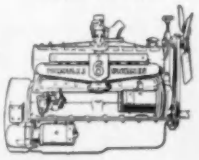
MARINE DIESEL



TURBO-CHARGED DIESEL



L-HEAD GASOLINE



HERCULES MOTORS CORPORATION
CANTON 2, OHIO

MACHINERY NEWS

(*Continued from page* 79)

operate as a subsidiary of Bliss, has been active in the design of special continuous strip annealing lines, continuous pickling lines, and hot dip equipment.

Ex-Cell-O Corp. is looking forward to a good year following record sales and earnings in the first quarter. The company reports earnings of $3.1 million on sales exceeding $30.1 million in the first three months. This report includes operations of Michigan Tool Co. which the company acquired in March of 1955.

Westinghouse has recently unveiled its new Mark II Cypak static switching component. The new components are modular plug-in cartridges encapsulated in polyester resin and fitted with terminals which plug into a specially designed power channel.

Pratt & Whitney Co., Inc., has purchased the assets and business of the Jaquith Carbide Die Corp. of Lynn, Mass. A. H. d'Arcambal, P&W president, stated that the company will be operated as the Jaquith Carbide Div. of Pratt & Whitney. The Jaquith organization will remain in Lynn.

Taft-Peirce Manufacturing Co. has announced that the Machine Tool Sales Co., division of Tool Supply & Engineering Co., will handle the sales of Taft-Peirce machine tools in the Dallas, Tex., area.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING

TDA® BRAKES

if it moves...we can stop it!

NEW "TW" BRAKE

. . . an economical new air brake designed for a variety of automotive applications

Outstanding control for a modest investment is offered by the new "TW" air brake. Ruggedly-built, dependable, and capable of long, trouble-free service, its economy is achieved principally through simpler design and improved manufacturing methods.

Air-actuated, the "TW" Brake operates through a precision-forged, one piece camshaft. The cam design provides a constant, equal rate of lift to both shoes. The entire shaft assembly is heat treated for maximum strength.

Fabricated steel brake shoes combine strength with lightness . . . hardened spool type cam rollers used with single-web, fabricated shoes provide perfect alignment with camhead. The roller, mounted in an open-type support, is always free to rotate. Brake linings are available up to ½" in thickness.

Other important features of the new "TW" Brake include: quick, one-point adjustment; air chamber and camshaft brackets mounted on the backing plate to form one compact assembly; available in a wide range of sizes and capacities.

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TIMKEN Detroit BRAKES
TIMKEN-DETROIT BRAKE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
ASHTABULA, OHIO
Accepted TDA Standard

For every industrial, agricultural or automotive application where braking is required!

TDA Plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

A Report on Automatic Arc Welding

A G-E WELDING ENGINEER EXPLAINS ARE TURNING MORE AND MORE TO

Roger W. Tuthill, Welding Process Engineer for the General Electric Company's Welding Department, answers some of the more frequently asked questions about the gas-shielded, consumable-electrode welding process.

Mr. Tuthill's answers explain the increased attention this process is receiving from production and welding people as automation begins to make greater demands on production welding.

Mr. Tuthill has been active in research and development on Fillerarc welding, General Electric's gas-shielded process, and has had a number of papers published on the subject.

Q. What is the gas-shielded welding process?

A. Gas-shielded welding is a consumable-electrode arc welding process which uses a reel of bare electrode wire fed mechanically through a welding head. Gas, such as carbon dioxide or argon, flows around the electrode to form a protective shield about the arc.

Q. Is there anything particularly new about gas-shielded arc welding?

A. Yes—if you're talking about ***automatic*** gas-shielded arc welding!

Historically, powdered flux has been used as the shielding agent in automatic arc welding, mainly because no gas process was economically feasible for welding mild steel. However, gas-shielding was attractive to many prospective users because it eliminated the many problems created by the use of flux—expensive flux recovery systems, flux inclusions in welds, flux in the air, more precise fixture requirements, and other difficulties.

Gas-shielding has been used for welding non-ferrous and stainless steels, but the relatively high costs of the inert gases used made gas-shielding impractical for mild steels.

Recently, the successful application of low-cost carbon dioxide as a shielding gas has finally made it economical to use gas-shielded equipment for welding mild steels. For example gas savings of 90% over inert gas costs have been reported. Since by far the most welding being done today is on mild steel, it is easy to see why this development is causing so many production people to turn to automatic gas-shielded arc-welding for answers to their production welding problems.

Q. Does a gas-shielded automatic welding system cost any more than other automatic arc welding systems?

A. The cost of setting up a gas-shielded system is about the same as for a comparable submerged-arc automatic system.

For example, while the ***purchase*** price of gas-shielded automatic equipment may be more than that of a submerged-arc system, the fact that there is no need for installing expensive flux recovery equipment and other cleaning systems with gas-shielded welding easily makes up the purchase price difference.

Q. Does the quality of welding done with gas-shielding compare with other welding processes?

A. Quality of welds made with the gas-shielded automatic welding process compares very favorably with other processes. Since no flux is used there is no possibility of flux inclusions; penetration is usually deeper; and the visible arc permits full control during welding. This visible arc permits less expensive fixtures to be used, an important cost factor in automatic welding.

Q. How about the speed and flexibility of a gas-shielded system? Can it be easily integrated into a production line?

A. A gas-shielded system can be used in production line welding as easily as any automatic welding system.

For example, the G-E Fillerarc system has electrode wire feed speeds which range up to 1000 inches per minute.

WHY FABRICATORS OF MILD STEEL AUTOMATIC GAS-SHIELDED WELDING

The automatic head can be rotated through 360 degrees and can be used for circular or seam welds, and, if necessary, more than one welding head can be used to make multiple welds.

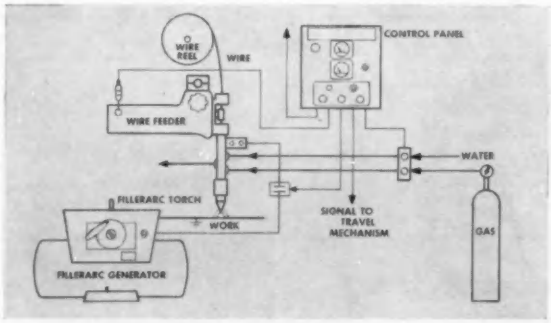
These characteristics make the Fillerarc system flexible and fast enough for almost any production line. Perhaps of equal importance to production people is the system's insensitivity to incoming line voltage, which assures constant production speed and weld quality.

Q. To sum up, what are the really important advantages of the automatic gas-shielded welding process?

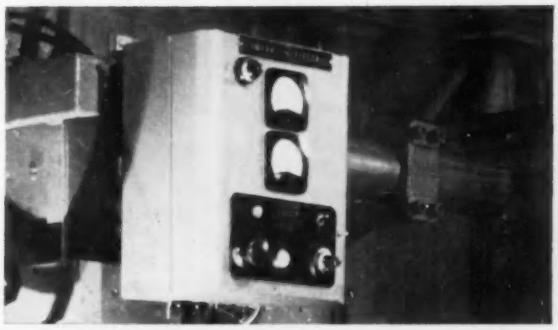
A. In a few words, the most important advantages of the automatic gas-shielded process are flexibility, high welding speeds, uniform weld quality, elimination of the cleaning problems associated with the use of flux, versatility for use with all types of metals, and most important of all, the ability to use low-cost carbon dioxide for shielding.

For more information about Fillerarc automatic gas-shielded welding see your nearby G-E Welding Distributor, or write for Bulletin GEC-1334, Section 713-4, General Electric Company, Schenectady, N. Y.

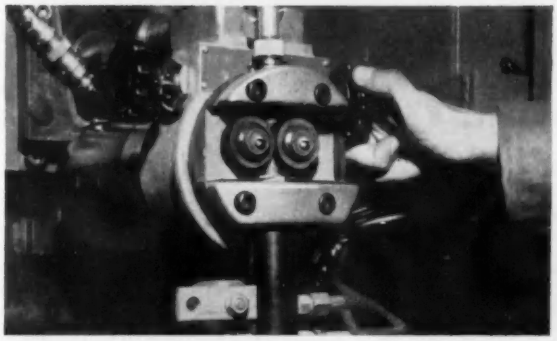
See G-E Fillerarc automatic welding equipment demonstrated at the American Welding Society Convention, Buffalo, N. Y., May 9–11. Booth numbers 47, 48, 49.



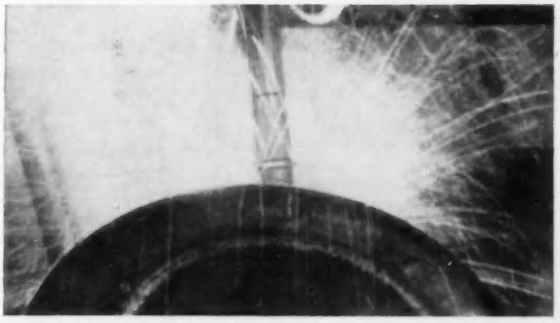
G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode, gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.



WIDE RANGE OF WIRE-FEED SPEEDS—up to 1000 inches per minute—makes the G-E Fillerarc system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



FLEXIBILITY OF FILLERARC SYSTEM is also demonstrated by the automatic head. It rotates 360 degrees, allowing even overhead welding. Arc is completely visible since gas is used as the shield instead of flux.



CIRCULAR OR SEAM WELDS may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc power sources, rectifier or motor-generator, and carbon dioxide combine for low-cost, quality welds on mild steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC

3 NEW G-E Power Sources for Automatic Welding

Now, three new General Electric 800-amp rectifier welders join the already-proved Fillerarc 450-amp motor-generator set as power sources for the expanding gas-shielded automatic welding process.

The three new power sources are designated FILLERARC, REGULARC, and DIRECTARC and offer a complete choice of output characteristics and automatic features. (See comparison chart below.)

FILLERARC—gives you the ideal power source for automatic gas-shielded welding. Like the 450-amp Fillerarc motor-generator, this rectifier welder has a unique rising volt-ampere characteristic which automatically matches the arc requirements for all electrode wire feed speeds. It is immune to changes in incoming line voltage, thus assuring consistent weld quality.

REGULARC—The first *true* constant-potential power source offered for automatic welding, this welder provides all the features of the Fillerarc model except that it has a flat volt-ampere characteristic. This is the set for you if your application requires regulation of incoming line voltage and only relatively small changes in electrode wire feed speeds.

DIRECTARC—With minimum investment, Directarc offers the same high quality design and construction of the other models without the automatic features. Directarc is the choice for you if you have a well-regulated incoming line voltage and your application requires only one arc length and electrode wire-feed speed.

QUALITY RECTIFIER FEATURES — All three models offer the same high quality you've come to expect in G-E rectifier welders—quiet operation, combination cleaning-cooling fan, easily removable side covers, and Class H silicone insulation.

For more information see your nearby G-E Welding Distributor (He's listed in the yellow pages of your phone book) or write Section 713-5, General Electric Company, Schenectady 5, N. Y.

Power Source	Output Volt-ampere curve	Immune to Incoming Line Voltage Change	Adjustable Starting Voltage	No Change in Arc Length with Change in Electrode Wire Feed Speed
FILLERARC	Rising	Yes	Yes	Yes
REGULARC	Flat	Yes	Yes	No
DIRECTARC	Essentially Flat	No	No	No

Progress Is Our Most Important Product

GENERAL ELECTRIC

HOW DOES GARRETT GIVE SUCH SERVICE?

What others may call impossible Garrett comes through as routine service. It seems as though they treat each order as the only one in their three plants. Everybody pitches in for service with the customer in mind.

If it is a stock item such as lock washers, flat washers, spring washers or hose clamps the order is usually on the way the same day. If it is stampings or assemblies Garrett engineers, production men and die makers team up to make their high-speed automatic equipment really hum . . . and your order is in your hands in half the time.

Want to be surprised by real service you can't beat? Next time send your order to Garrett for . . .

LOCK WASHERS
FLAT WASHERS
HOSE CLAMPS
SPRING WASHERS
STAMPINGS

Manufactured by

GEORGE K. GARRETT CO., Inc.
Philadelphia 34, Pa.

Garrett
OF PHILADELPHIA

SAE Aeronautic Meeting

(*Continued from page* 53)

and powerplant improvements made during the past 10 years, have solved early questions of fuel economy, making them economical for both short and long range routes. This factor was brought out by Richard S. Shevell of Douglas Aircraft Co., Inc., who cited that at a range of 1000 nautical miles a DC-8 powered with the JT-3 engine (commercial version of the J-57) has a 22 per cent direct operating cost advantage over the DC-6B.

ACCESSORY DRIVES

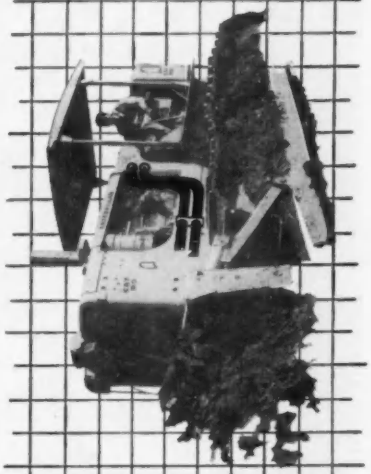
COMPARISONS were made of a direct driven accessory power system, utilizing hydraulic constant speed drives, with a pneumatic accessory power system, utilizing air turbine drives, in a detailed discussion presented by Richard L. McManus of General Electric Co. He concluded that installed weight is usually lower for the pneumatic but the fuel penalty is generally more costly; that the direct drive system is generally heavily penalized by the drag consideration; and that a thorough analysis of installed weight, fuel weight for power extraction and drag should be conducted on each new design to arrive at the optimum system.

VERTICAL LIFT AIRCRAFT

VERTICAL lift aircraft received a good share of attention in one technical session at which three papers were presented. Charles H. Zimmerman, National Advisory Committee for Aeronautics, felt that in applications requiring much hovering flight, the helicopter is unchallenged, but that in applications where hovering is only incidental, the VTOL airplane appears to be attractive. He referred to the several possible configurations, such as tilt wing or deflected slipstream when used with propellers, and ducted fan when used with jets. Convertiplanes and other VTOL aircraft were appraised in papers by K. S. Coward and E. R. Hinz of Ryan Aeronautical Co., and R. J. Woods of Bell Aircraft Corp. All of the speakers recommended extensive further development of VTOL and STOL aircraft, pointing to distinct advantages under restrictive operations or airfield conditions.

(*Turn to page* 142, *please*)

TELEFLEX® SOLVES CONTROL PROBLEM:



HOW TO START a Cat Diesel Tractor— ALWAYS!

Problem: a 30-ton Caterpillar D9 Diesel Tractor; provide gasoline starting engine with choke and throttle controls that *always* work!

Caterpillar engineers solved this one with a 56" Teleflex control linkage. Running from the dashboard to the gasoline starting engine, the closed Teleflex system follows a curved path and is armored for complete protection. With Teleflex, operators find that the starting controls of their big yellow D9s work regardless of ice, snow, mud or dust. There's no wobble, no rattle; the controls retain their "feel" and accuracy.

ANOTHER CONTROL JOB— SOLVED WITH TELEFLEX!

Teleflex is a compact, single-path control linkage that follows any desired devious route. A flexible, rack-like cable, operating through precisely drawn conduit, transfers linear, arc, or rotary controlling motion as tension or compression push-pull motion. Wherever rotary motion, up to a full revolution or more, is required, the cable helix meshes precisely with a hobbed control wheel.

A VARIETY OF CONTROL APPLICATIONS plus product, design and engineering information, are illustrated in descriptive *Bulletin 500*. Send for a copy to TELEFLEX INCORPORATED, 125 S. Main Street, North Wales 1, Pa.

TELEFLEX
MECHANICAL CONTROLS
LINKAGES MECHANISMS

New!
PATTON
oil seal puller

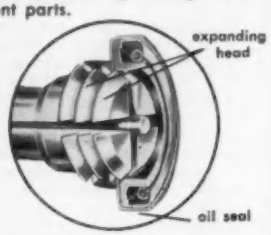
SAVE TIME.. MONEY

New oil seal puller does the job quickly and easily without damage to parts and castings.

The Patton Oil Seal Puller was designed to eliminate the waste of time in removing oil seals. In addition to the time-saving advantages, this precision tool prevents scoring and damage to the metal seat that holds the oil seal.

The complete set consists of six expanding heads and two hammers. The size range, from ⅜" to 4½", handles all oil seals in general use. Larger or special sizes may be custom made for specific requirements.

Originally designed for the Armed Forces, the Patton Oil Seal Puller is now used by maintenance and repair shops in the following industries: aircraft, automotive, agriculture, construction, marine and oil fields. In fact, wherever machinery and equipment are repaired, Patton Oil Seal Pullers save costly man hours and prevent unnecessary damage to component parts.



Guaranteed All parts of the Patton Oil Seal Pullers are fully guaranteed by the manufacturer. Each item is thoroughly tested before shipment. Only high quality tool steel is used in the expanding head. Small nicks in the lips of the expanding head, caused by improper care, do not greatly impair the efficiency of this tool.

Contact your local bearing or supply house for more details or write the factory.

PATTON
MANUFACTURING CO., INC.
1802 West Pleasant St.
Springfield, Ohio

SAE Aeronautic Meeting

(*Continued from page* 141)

GUEST SPEAKERS

THE meeting program was well-rounded by the principal speakers who appeared at the four luncheon sessions. During the aeronautic production forum luncheon, Dudley C. Sharp, Assistant Secretary of the Air Force, Materiel, spoke on the subject of "Readiness and Reliability." He said that "we in the Air Force are fast approaching the time when we must procure weapon systems as much for reliability, simplicity and maintain-ability, as for performance." Air Commodore F. R. Banks, director of Bristol Aeroplane Co., Ltd., in a presentation entitled "Why Ask Me?" given before the aircraft propulsion luncheon, predicted that "the open cycle aviation gas turbine will be with us in one form or another for 30 years and more, but what form its heat source will take" he could not say. At the Air Transport luncheon S. G. Tipton, president, Air Transport Association of America, spoke on the subject of "Tomorrow's Magic Web" of air facilities. J. H. Smith, Jr., Assistant Secretary of the Navy for Air, was the guest speaker at the military luncheon, and the subject of his talk was "Democracy's Challenge to Technological Superiority." He stressed the need for constant continuing basic research and development and that "the great responsibility (for research) must be borne by all of the technical and industrial capacity in the United States."

WRIGHT BROTHERS AWARD

WENDELL E. REED of Solar Aircraft Co. was awarded the SAE Wright Brothers Medal for 1955 during the aircraft propulsion luncheon. He received this honor for his paper "New Approach to Turbojet and Ramjet Engine Control" which was presented at the SAE Golden Anniversary Aeronautic Meeting held in Los Angeles last year.

ENGINEERING DISPLAY

IN addition to the technical sessions and panels, an aircraft engineering display was provided where 35 exhibitors showed their most recent products.

Sperry Gyroscope Co. showed for the first time its vibration indicators for turbine engines; and announced a new airborne continuous fire detection system. Watertown Div., New York Air Brake Co., displayed its new Series 54F Stratopower hydraulic motors of the constant displacement axial piston type, employing the use of valve pistons placed in the same bores with the driving pistons. Jack & Heintz, Inc., exhibited the new D62-1 turbojet engine starter and a new 3000-va inverter, model F-45-10.

Vickers, Inc., showed a newly-introduced miniaturized piston type, 3000 psi pump, featuring compactness and light weight, for limited life and emergency power applications; also a one-kva isolated electrical power package, hydraulically driven. Saginaw Steering Gear Div., GM, showed a series of ball bearing screws and ball bearing splines, indicating that the former is now available in seven standard stock sizes as rolled threads. Stratos Div., Fairchild Engine & Airplane Corp. had on display a 3000 psig compressed air package, d-c motor driven, having a delivery of 1.8 scfm.

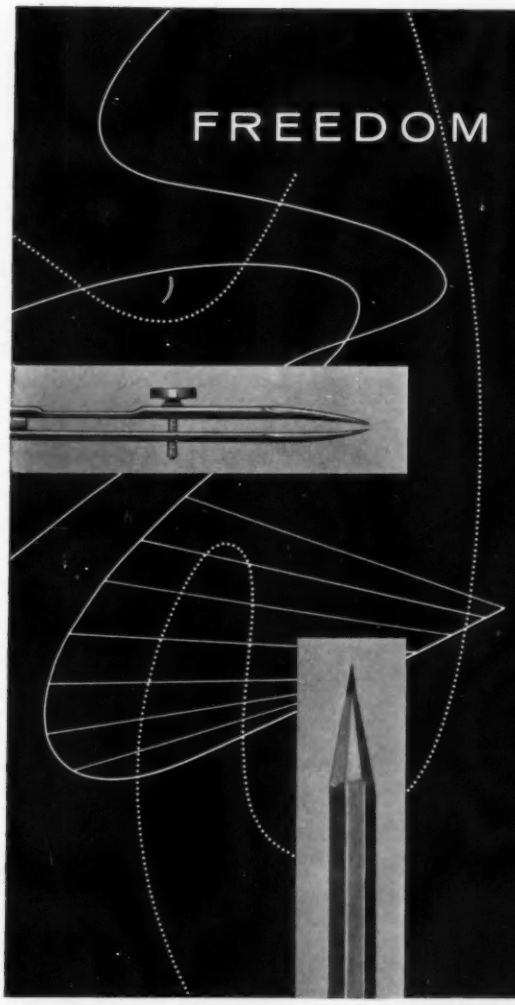
Thompson Products, Inc., showed sample products formed by its process for gathering integral ends on thin-wall tubing. Chandler-Evans Div., Niles-Bement-Pond Co. exhibited the AR-6 afterburner control such as used on the J-57. Pesco Products Div., Borg-Warner Corp. introduced a variable volume piston type hydraulic pump, having an output of 3 gpm at 1500 rpm at 3000 psi, which can work to 4000 psi and in temperatures up to 500 F; also showed axial flow blowers of a unique design for air delivery and exhausting requiring intermittent or continuous duty at rates from 16 to 750 cfm over a wide pressure range.

Lord Manufacturing Co. displayed an aircraft engine mount, the Dynafocal LM-200, such as used for the Allison 501-D13 in the Lockheed Electra. Linde Air Products Co. had samples of a new aluminum oxide coating, applied by "Flame-Coating," for high-temperature and corrosion resistance of base metals.

A number of larger units were displayed. Westinghouse Electric Corp. had a cutaway model of the J-34 axial flow turbo-jet; Fairchild Engine Div. showed a cutaway model of the J-44 turbo-jet for guided missiles and pilotless planes; General Electric Co. had a model of the J-47 turbo-jet; Curtiss-Wright Corp. exhibited the Armstrong Viper Jet of 1640-lb thrust; and Foote Bros. Gear & Machine Corp. showed a rotor transmission for the H-21 helicopter.

FREEDOM OF DESIGN

with Inland Self-Sealing Weather Strip

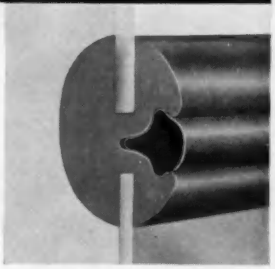


Inland Self-Sealing Weather Strip, with the separate filler strip, simplifies the design job, permits freedom for creative designing. No provision need be made for moldings, channels, binder strips or cement when designing with Inland Weather Strip.

You'll find that wherever Inland Weather Strip goes in, water stays out . . . in cars, buses, trucks, planes, trains, other over-the-road vehicles . . . in large and small boats that fight heavy seas . . . in factories, stores, theaters, hotels, homes, hospitals and many other structures. In fact, you'll find it wherever fixed windows of any size or shape must be positively sealed!

The patented Inland Filler Strip does it . . feeds easily into the locking channel . . . sets up positive, permanent pressure on **both** fence and glass! Installation, or glass replacement, is fast work for **only one man**, and done **on the job.**

INLAND
self-sealing weather strip
(PATENTED)



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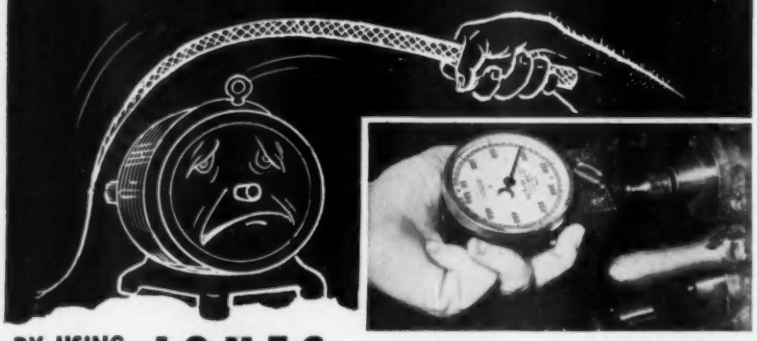

CHECKS SPEED *Periodically*

SHOWS SPEED *Continuously*

BY USING **JONES TACHOMETERS**

How can you get the most from your machinery without sacrificing the quality of your product? A **JONES TACHOMETER** will give you the answer in RPM's, FPM's, etc. JONES TACHOMETERS are used widely in every type of industry to check and maintain best performance of operating equipment. Both Portable (as illustrated) and permanently installed types are available at surprisingly moderate cost.

• *WRITE FOR BULLETIN 146-G* •

JONES MOTROLA CORP.
Stamford, Conn.

MEN *in the* NEWS

(*Continued from page* 41)

Link-Belt Co.—Richard E. Whinrey has been elected a vice-president.

Chevrolet Motor Div., General Motors Corp. — **Leonard R. Mason** has been made manager of the St. Louis assembly plant; **Leonard F. Coyle,** manager of the Atlanta assembly plant; **Harvey L. Green,** general superintendent of production for the Atlanta plant; **John H. Greenough,** manager of the Indianapolis truck body plant; **James H. Allen** and **Earl A. Hall** have been assigned to the Central Office manufacturing staff.

Timken Roller Bearing Co.—**James F. Reid** has retired as general production manager.

Dodge Div., Chrysler Corp.—**Arnold C. Thomson** was named advertising manager for cars and trucks.

Champion
BY MILSCO

NO. F850

BODY-FORM POSTURE DESIGN FOR IMPROVED WORK-POWER

Designed to improve the road-ability and comfort-factor of many types of mobile equipment. Full cushion roomy seat equipped with permanently aligned synchronized "no-sag" springs and foam rubber topper. Contour back rest deeply cushioned with foam rubber and jute felt. Snap-on detachable arm rests add to operating comfort and seat versatility. Ball type seat adjuster with finger-lift handle. Get the complete facts on this popular Milsco "Champion" . . . one of the finest cushion seating products of our more than quarter century experience.

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SOLID TUBULAR STEEL FRAME

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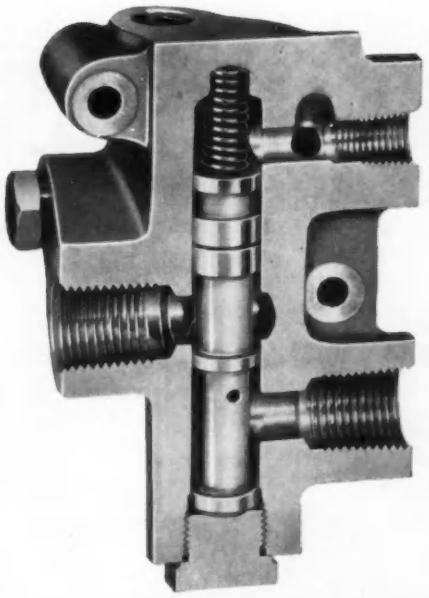


NEW Webster Flow Divider

THE MOST ECONOMICAL ANSWER FOR POWER STEERING

and other dual applications

WEBSTER'S NEW FLOW DIVIDER is a specially developed flow control valve specifically designed to provide the utmost economy in power steering and other applications where two separate hydraulic power circuits are to be served. It has been used with great success on agricultural equipment, road-building machinery, materials-handling equipment, and for many other purposes. Its advantages include:

Greatest Economy • Use of the Flow Divider eliminates any necessity for a second hydraulic pump and driving medium—cuts equipment and installation costs substantially.

Less Hydraulic Piping • Use of the Flow Divider simplifies and reduces the amount of hydraulic piping required, since it eliminates the inlet piping which would be required for a separate pump, and it can be installed close to the secondary demand.

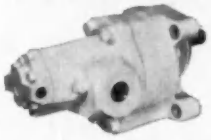
Flexibility • The Flow Divider can be installed remotely from the pump, thus providing greater flexibility in the design of hydraulic circuits.

Compactness • The small size (2″x 3″x 5½″) of the Flow Divider eliminates installation problems.

In most applications the Flow Divider is adjusted to provide constant flow to the secondary system. For example, in power steering applications 2½ gpm are constantly diverted to the steering circuit. However, Flow Dividers can also be adjusted to allot pump capacity proportionately between primary and secondary circuits.

The Flow Divider has a capacity of up to 20 gpm at 2000 psi. A built-in damping device prevents noise, eliminates "hunting" effect. It can be provided with a built-in relief valve, if desired.

TANDEM PUMP COMBINATIONS



For those dual applications where you want two pumping units, Webster's Tandem Pump Combinations provide an economical, completely dependable answer. Rated at 1000 psi and 1750 rpm, these combinations are provided with a capacity range for the larger pump from 4.8 to 29.0 gpm. The small pump has a capacity range from 1.0 to 4.0 gpm.

Write today for complete information

AH-3

- ☐ Please send us complete information on Webster Flow Divider
- ☐ Please send us complete information on Tandem Pump Combinations
- ☐ Please send catalog on complete Webster line

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Title_____

Company_____

Street_____

City, Zone & State_____

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WEBSTER ELECTRIC

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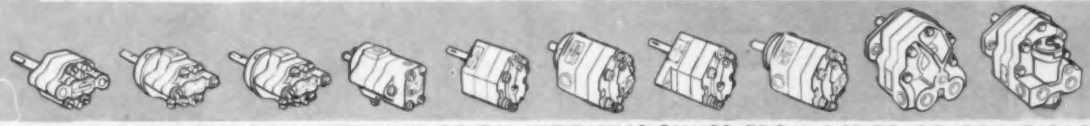
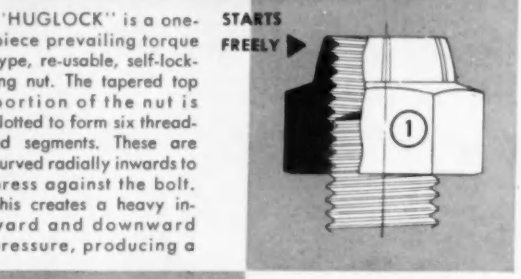
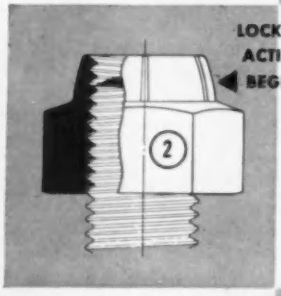


MANUFACTURERS OF A COMPLETE LINE OF OIL HYDRAULIC PUMPS FROM 1/5 TO 30 GPM CAPACITY

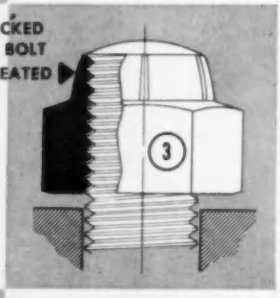
HUGLOCK self-locking nuts with prevailing torque . . . . . .

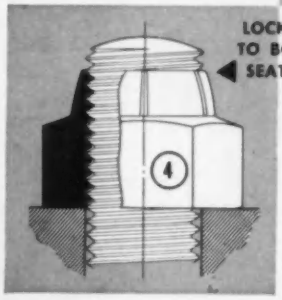
"HUGLOCK" is a one-piece prevailing torque type, re-usable, self-locking nut. The tapered top portion of the nut is slotted to form six threaded segments. These are curved radially inwards to press against the bolt. This creates a heavy inward and downward pressure, producing a





friction lock, between the load carrying flanks of the nut and the bolt threads. The combined metal to metal hugging and locking friction is distributed over all of the threads, enabling "HUGLOCK" to grip the bolt firmly, until removed by a wrench . . . The one-piece all metal construction and the continuous thread, extending through the length of the nut, provide maximum thread shear strength. The "HUGLOCK" principle can be incorporated into nuts of standard size, with standard threads or special sizes with special threads . . . "HUGLOCK" maintains its locking action, through repeated removals or re-use on the same bolt or a similar bolt of commercial thread tolerance. It locks to the bolt, whether the nut is seated or unseated. "HUGLOCK" eliminates axial thread play which tends to make a nut creep from its seat and work loose, under severe vibration or shock . . . All lock washers, cotter pins, key plates and other locking devices can be eliminated . . . The "HUGLOCK" section of our catalog contains 24 pages. It includes complete information, specifications, engineering data, prices; will be furnished on request.





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STAINLESS STEEL
Sells and Re-sells!

McLOUTH
STAINLESS
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The Stainless Steel trim, molding and vital parts that add style and beauty to a car, inside and out, are features that help make the sale.

Stainless Steel has wide customer acceptance. It's easy to clean and keep clean. It's a tough, solid metal that will not corrode or dent and stands up to gravel, ice, salt and water.

The finish never fades and parts are easy to replace. Stainless Steel lasts the life of the car. It *sells* in a new car and it *re-sells* in a used car.

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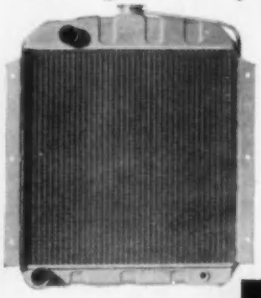
designed by **Young** offers



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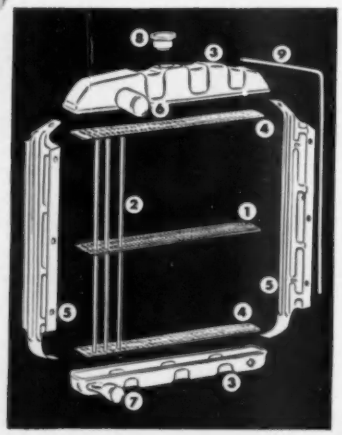
Less Weight!

Better Performance!



1. Fin design gives sufficient air turbulence for maximum heat transfer.

2. Double lockseam tube provides strong backbone for entire core.

3. Die-formed header; reinforced 1-piece, heavy duty brass top and bottom tanks.

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6. Fabricated brass inlet and (7) outlet. Maximum flow area, minimum resistance to coolant circulation.

8. Neck for pressure type cap. Safe; no water loss from after-boil.

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Multiform BIG BROTHER BENDER

Model BBB

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Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

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Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

Allison Div. General Motors 152
American Chemical Paint Co. 108
American Gear & Mfg. Co. 112
American Plastics Corp. 107
Automatic Transportation Co. 76
Automotive Gear Works, Inc. 43

B

Baird Machine Co. 74
Bendix Aviation Corp.
Bendix Products Div. 30
Bethlehem Steel Co. 129
Black & Decker Mfg. Co. 19
Blood Bros. Machine Div. 46
Brown Corp. 116
Buffalo Bolt Co. 134
Bullard Co. 7

C

Central Foundry Div. G.M. 14-15
Century Gas Equipment Co. 133
Cincinnati Milling Machine Co. 32
Clark Equipment Co. 117
Cleveland Cap Screw Co. 115
Copper & Brass Research Assn. 11
Copperweld Steel Co. Steel Div. 91
Cotta Transmission Co. 1
Crane Packing Co. 111
Cross Co. 12

D

Danly Machine Specialties, Inc. 9
Dewey & Almy Chemical Co. 24
du Pont de Nemours & Co. Elastomers Div. 97

E

Eaton Mfg. Co. (Saginaw Div.) 77
Enjay Co., Inc. 105
Ex-Cell-O Corp. 103

F

Fellows Gear Shaper Co. 44-45

G

G & O Mfg. Co. 146
Garrett Co., Inc., Geo. K. 141
General Electric Co.:
Motor & Generator Dept. 130-131
Silicone Products Dept. 17
Welding 138-139-140
Goodrich Chemical Co., B. F. 8
Greenlee Bros. & Co. 42

H

Handy & Harman 122
Hercules Motors Corp. 136

I

Index Machine Co. 102
Industrial Filtration Co. 104
Inland Mfg. Div. 143
International Nickel Co., Inc. 2

J

Jones & Laughlin Steel Corp. 5
Jones Motrola Corp. 144

K

Kalamazoo Div. New York Air Brake Co. 47
Kasle Steel Corp. 148

L

Lansing Stamping Co. 146
Lord Mfg. Co. 113

M

McLouth Steel Corp. 147
Mack Mfg. Corp. 148
Mahon Co., R. C. 75
Mallory & Co., P. R. 18
Mechanics Universal Joint Div. 20
Michigan Drill Head Co. 25
Milsco Mfg. Co. 144

N

National Acme Co. 118-119
National Automatic Tool Co. 99
National Machine Products Co. 146
National Machinery Co. 123
National Standard Co. 88
New Britain Machine Co.
(Gridley Machine Div.) 127-128
New Departure Div. ..... Back Cover
New York Air Brake Co.
(Kalamazoo Div.) 47

P

Patton Mfg. Co. 142
Perfect Circle Corp. 95
Pesco Products Div. 135
Pratt & Whitney Co. 120

R

Raybestos-Manhattan, Inc.,
Equipment Sales Div. 22-23
Richards Co., J. A. 149
Rigidized Metals Corp. 132
Rotor Tool Co. 4

S

S-P Mfg. Corp. 126
Schwitzer Corp. 73
Sharon Steel Corp. 21
Simmons Fastener Corp. 10
Standard Oil Co. (Ind.) ..... 2nd Cover
Standard Pressed Steel Co. 6-29
Sterling Aluminum Prod., Inc. 78
Sun Oil Company 109-110
Synchro Start Products, Inc. 148

T

Teleflex, Inc. 141
Texas Co. 40
Thompson Products, Inc.,
Michigan Div. 27
Thomson Industries, Inc. 114
Timken Detroit Brake Div. 137
Timken Roller Bearing Co. 16
Torrington Co. 101
Tuthill Pump Co. 106
Tuthill Spring Co. 149

U

Udylite Corp. 28
United States Steel Corp.,
Gerrard Steel Div. 151

W

Waldes Kohinoor, Inc. 13
Wales-Strippit Corp. 149
Warner Electric Brake & Clutch Co. 121
Webster Electric 145
Western Felt Wks. 148
Westinghouse Electric Corp. 124-125
Wyman Gordon Co. 126

Y

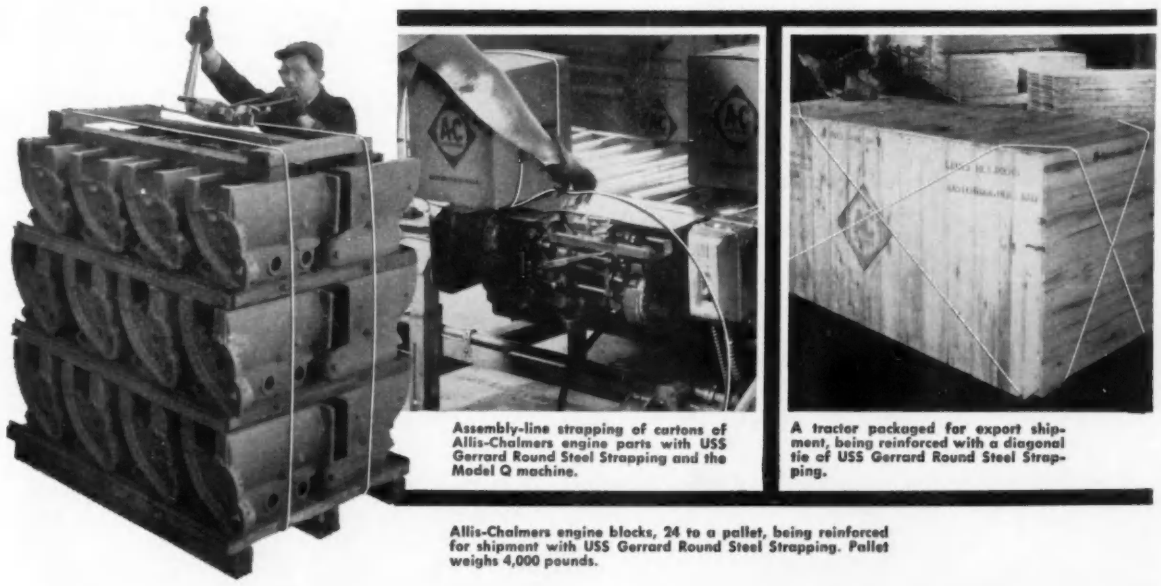
Young Radiator Co. 148

Z

Zollner Corp. ..... 3rd Cover

USS GERRARD

ties anything you've ever seen



Assembly-line strapping of cartons of Allis-Chalmers engine parts with USS Gerrard Round Steel Strapping and the Model Q machine.

A tractor packaged for export shipment, being reinforced with a diagonal tie of USS Gerrard Round Steel Strapping.

Allis-Chalmers engine blocks, 24 to a pallet, being reinforced for shipment with USS Gerrard Round Steel Strapping. Pallet weighs 4,000 pounds.

Allis-Chalmers Manufacturing Company, Tractor Works, West Allis, Wis., reinforces packages of all sizes quickly, securely, and inexpensively with USS GERRARD ROUND STEEL STRAPPING

When Allis-Chalmers West Allis, Wis., Tractor Works began packaging replacement parts in cartons to improve its shipping operation, USS Gerrard Round Steel Strapping was chosen as reinforcement. As a result, it provides a neat, inexpensive way to close cartons quickly, protects the product, saves the carton for re-use, and displays the advertising on the box continuously.

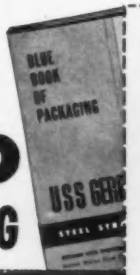
Allis-Chalmers is using USS Gerrard Round Steel Strapping to secure packages which vary from 4-inch-square boxes, weighing less than a pound, to huge 38" x 30" x 34½" cartons which weigh up to 3,000 pounds. Even complete tractors are disassembled and crated for export to reduce cubage charges. They, too, are reinforced with USS Gerrard Round Steel Strapping.

Take a tip from a highly successful organization, and try USS Gerrard Steel Strapping – Round or Flat. Whatever your packaging-tying problem might be, our engineers can help you find the safest, most economical solution. Contact us now.

GERRARD STEEL STRAPPING DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CHICAGO, ILLINOIS

USS GERRARD STEEL STRAPPING
Round and Flat

UNITED STATES STEEL



SEND FOR THIS NEW BOOKLET NOW

Gerrard Steel Strapping
4725 South Richmond St., Chicago 32, Ill.

Please send me, free of charge, the new 36-page GERRARD Blue Book of Packaging.

Name .....
Company .....
Address .....
City ..... State.....

Super drive for a super grader

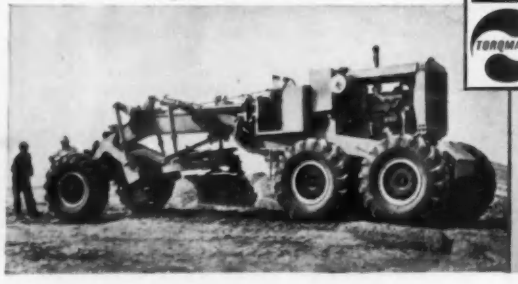
TO GET more "push-power" *at the blade*, Galion uses an Allison TORQMATIC DRIVE in its new T-700 Grade-O-Matic grader.

Galion says the integrated TORQMATIC Converter-Transmission *team* "eliminates the foot clutch – ends 'down-time' for clutch maintenance and repairs – does the shifting *work* for you – makes driving fast and easy."

The Allison TORQMATIC DRIVE multiplies engine torque up to 13½ times, absorbs harmful shock loads and prevents engine lugging and stalling. It gives the T-700 3 forward and 3 reverse speeds–from 0.9 to 20 m.p.h.–and permits the operator to make any shift while moving in either direction.

And the TORQMATIC DRIVE reduces operator-skill requirements in this 20-ton grader because it eliminates the "human element" needed to get top grader performance.

For full information on the Galion T-700 see your Galion dealer or write Galion Iron Works, Galion, Ohio.



GM TORQMATIC

Allison

TORQMATIC DRIVES

ALLISON DIVISION OF GENERAL MOTORS
Indianapolis 6, Indiana

CLEAR-O-MATIC*

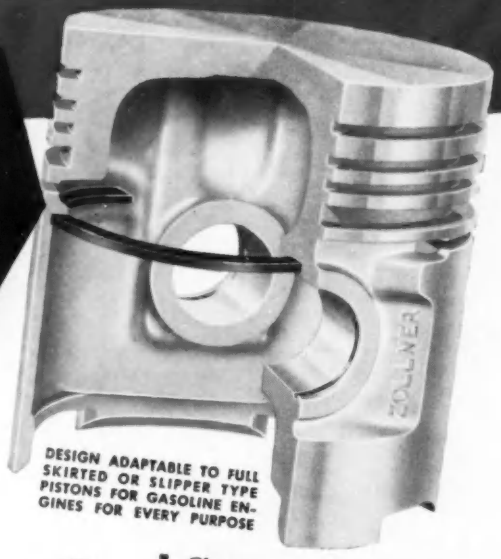
The All-Temperature Piston

UNIFORM SKIRT CLEARANCE FROM 20° BELOW ZERO TO 200° F

STEEL TENSION MEMBER

Anchored only at pin bosses and cast in positive contact with I.D. of piston skirt

Controls Clearance Automatically

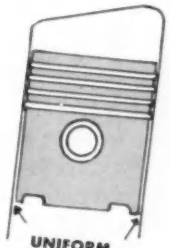


DESIGN ADAPTABLE TO FULL SKIRTED OR SLIPPER TYPE PISTONS FOR GASOLINE ENGINES FOR EVERY PURPOSE

Sensational Performance

Requires less than .001 Clearance

Cold or Hot, Clear-O-Matic Piston clearance stays constantly uniform. Required clearance is reduced to less than .001. This great development of the "All-Temperature" Piston by Zollner engineers provides another fine feature attraction for the modern motor car . . . smooth, quiet running engine . . . no cold slap . . . reduced friction without loss of durability or heat conductivity . . . no danger of scuffing or seizing. We suggest a test of these sensational performance advantages for your engine.



UNIFORM EFFECTIVE SKIRT CLEARANCE AT ALL TEMPERATURES

1. Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
2. Effective expansion identical with ferrous cylinder.
3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
5. Durability and conductivity comparable to heavy duty design.

*T.M. Reg. Pat. App. For

ADVANCED ENGINEERING

PRECISION PRODUCTION

COOPERATION with Engine Builders

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

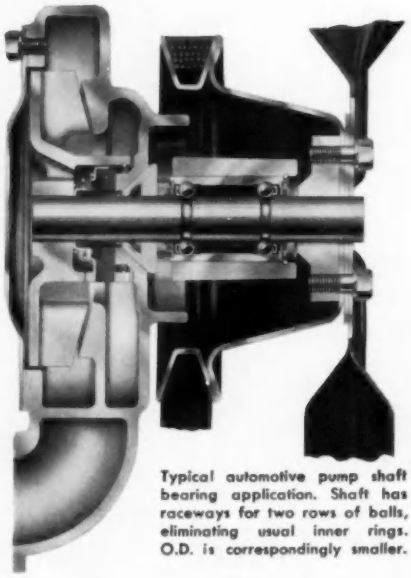
ZOLLNER

ZOLLNER • Fort Wayne, Indiana

FACTS

about

NEW DEPARTURE BALL BEARINGS

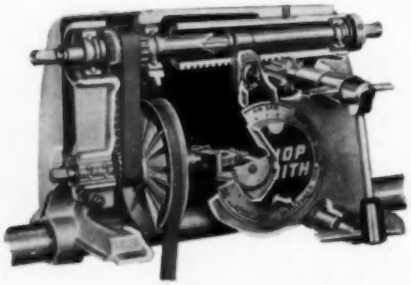


Typical automotive pump shaft bearing application. Shaft has raceways for two rows of balls, eliminating usual inner rings. O.D. is correspondingly smaller.

FAN AND PUMP SHAFT BEARING IS ADAPTABLE TO MANY USES!

This sealed and "lubricated-for-life" bearing with integral shaft was originated by New Departure specifically to simplify automotive fan and water pump mounting. Since its inception, it has reduced bearing maintenance requirements to virtually zero in millions of car, truck and other engines.

Because of its unique design and ability to locate parts on its shaft against loads from any direction, designers find it a highly *versatile* bearing, adaptable to many other uses.



Integral shaft of bearing serves as intermediate shaft in Magna's "Shopsmith". Assures fewer parts, easier machining, more accurate, quicker assembly.

The manufacturer of a well-known power tool, which combines the functions of several tools in one compact unit, employs the pump shaft bearing as a complete intermediate shaft with pulleys on both ends, with obvious design and performance advantages.

Another manufacturer produces a power mower in which two of these versatile NEW Departures with hollow shafts not only support the mower rotors, but permit vertical adjustment of the wheel spindles to regulate cutting height.

So here is another NEW Departure adaptable to many uses. New Departure engineers can show you what it and other ball bearings will do to improve your products.

FINE BALL BEARINGS MAKE GOOD MACHINES BETTER

For each McCulloch Mower, New Departure provides two pump shaft bearings with hollow shafts to permit vertical adjustments. Special heat treating gives full hardness at the raceways but adequate toughness in the shaft to withstand hard service.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.